5-4120-384-14

TM 5-4120-384-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

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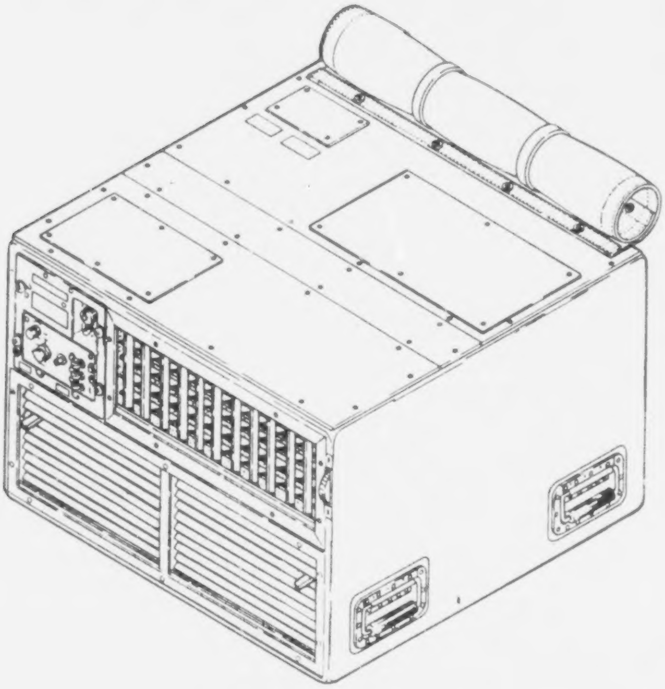

AIR CONDITIONER
HORIZONTAL COMPACT
18,000 BTU/HR
208 VOLT, 3 PHASE,
50/60 HERTZ
MODEL F18H-3S
(4120-01-165-1125)

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY
27 MAY 1985

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CHANGE
NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 9 MAY 1988

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

AIR CONDITIONER, HORIZONTAL, COMPACT, 18,000 BTU/HR, 208 VOLTS, 3 PHASE, 50/60 HERTZ MODEL F18H-3S (4120-01-165-1125), MODEL F18H-3SA (4120-01-237-4663), MODEL F18H-3SB (4120-01-268-4451), AND 230 VOLTS, SINGLE PHASE, 60 HERTZ MODEL F18H-1S (4120-01-268-4450)

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5-83 and 5-84	5-83 and 5-84
B-7 and B-8	B-7 and B-8
Index 3 and Index 4	Index 3 and Index 4

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator, Unit, Direct Support and General Support Maintenance Requirements for Air Conditioner, Horizontal Compact, 18,000 BTU, 208V, 3PH, 50/60HZ (F18H-3S).

CHANGE
No 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 December 1986

Operator's, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, HORIZONTAL, COMPACT,
18,000 BTU/HR
208 VOLTS, 3 PHASE, 50/60 HERTZ
MODEL F18H-3S
(4120-01-165-1125)
AND MODEL F18H-3SA
(4120-01-237-4663)

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Remove pages	Insert pages
i through iv	i through iv
1-0	1-0
1-1 through 1-6	1-1 through 1-6
---	1-8.1 and 1-8.2
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2-9 through 2-16	2-9 through 2-16
3-1 and 3-2	3-1 and 3-2
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---	5-22.1 and 5-22.2
5-43 through 5-76	5-43 through 5-76
5-83 and 5-84	5-83 and 5-84

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WARNING

The panels, doors, and screens on this unit are there for a purpose.

Do not operate this unit with them off or open unless the instructions tell you to. When this is necessary, do so with care.

- All electrical connections can shock and sometimes kill.
- Moving parts can cut off fingers or hands.
- Do not wear loose clothing near moving parts such as fans and shafts.

Read all Warnings and instructions carefully before operating or working on this unit. Read and understand all Warnings listed in the front of this manual.

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment.

DEATH

or severe injury may result if you fail to observe safety precautions.

Never use a heating torch on any part that contains Refrigerant R-22. Do not let liquid refrigerant touch you and do not inhale refrigerant gas.

WARNING

DANGEROUS CHEMICAL
is used in this equipment.

DEATH

or severe injury may result if personnel fail to observe safety precautions.

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin - eye - contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

WARNING

HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

Remove personal items such as watches andrings prior to working on this equipment

Never work on electrical equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the input power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before toucning it.

Be careful not to contact high-voltage connections of 208 volts ac input when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

Do not operate the equipment without all grilles, guards, louvers, and covers in place and tightly secured.

Warning: Do not be misled by the term "low voltage." Potentials as low as 50 volts may cause death under adverse conditions.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

WARNING

Clean parts in a well ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvent. Wash exposed skin thoroughly.

Dry cleaning solvent (Fed Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property.

Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 50°C).

Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 psig (2.1 kg/cm^2).

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).

WARNING

The burning of polyurethane foams is dangerous.

Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation nearby, you should take care to ventilate the area thoroughly. An exhaust system like that of a paint spray booth should be used.

Air-supplied respirators, approved by the National Institute for Occupational Safety and Health or the U.S. Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate.

Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

TECHNICAL MANUAL
NO. 5-4120-384-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 27 May 1985

Operator's, Organizational, Direct Support and General Support Maintenance Manual

AIR CONDITIONER, HORIZONTAL, COMPACT,
18,000 BTU/HR
208 VOLTS, 3 PHASE, 50/60 HERTZ
MODEL F18H-3S (4120-01-165-1125), MODEL F18H-3SA (4120-01-237-4663)
MODEL F18H-3SB (4120-01-268-4451)
AND
230 VOLTS, SINGLE PHASE 60 HERTZ
MODEL F18H-1S (4120-01-268-4450)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, Attention: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. A reply will be furnished to you.

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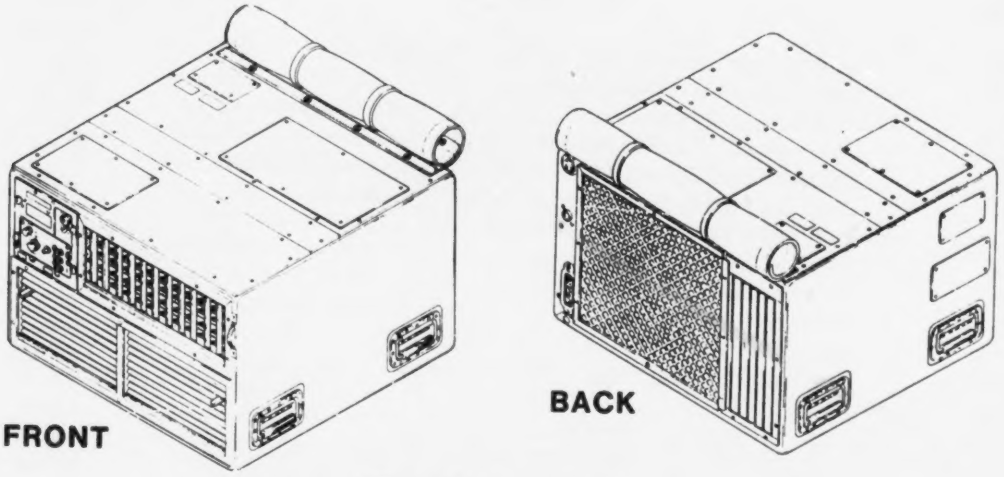
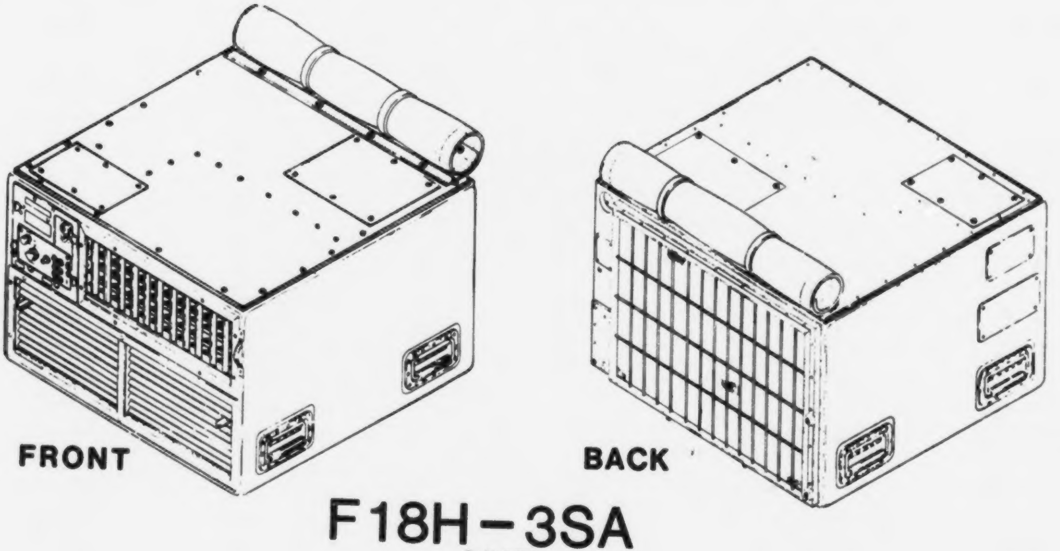


F18H-3S
AND
F18H-1S



F18H-3SA
AND
F18H-3SB

Figure 1-1. Air Conditioner

CHAPTER 1

INTRODUCTION

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Section I GENERAL INFORMATION

1-1. SCOPE.

a. Type of Manual. Operator's, Organizational, Direct Support, and General Support Maintenance Manual.

b. Model Number and Equipment Name. Keco Models F18H-3S, F18H-3SA, and F18H-3SB Horizontal, Compact, 18,000 BTU/HR, 208 Volt, 3 Phase, 50/60 Hertz, Air Conditioners and Keco Model F18H-1S Horizontal, Compact, 18,000 BTU/HR, 230 Volt, Single Phase, 60 Hertz, Air Conditioner.

c. Purpose of Equipment. Cools and heats enclosed space (shelter). The unit covered by this manual is designed for cooling and heating air to a desired predetermined range and circulating the conditioned air to provide heating and cooling of equipment or personnel within the conditioned area.

1-2. MAINTENANCE FORMS AND RECORDS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pamphlet 738-750, The Army Maintenance Management System (TAMMS).

1-3. HAND RECEIPT MANUAL.

This manual has a companion document with a TM number followed by "-HR" (which stands for Hand Receipt). The TM5-4120-384-14-HR consists of preprinted hand receipts (DA Form 2062) that list end item related equipment (i.e., COEI, BII, and AAL) you must account for. As an aid to property accountability, additional -HR manuals may be requisitioned from the following source in accordance with procedures in Chapter 3, AR 310-2:

The U.S. Army Adjutant General Publications Center
2800 Eastern Boulevard
Baltimore, MD 21220.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

If your Air Conditioner needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Tell us why a procedure is hard to perform. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at:

Commander, U.S. Army Troop Support Command
Attention: AMSTR-QX
4300 Goodfellow Boulevard
St. Louis, Missouri 63120-1798.

We will send you a reply.

Section II EQUIPMENT DESCRIPTION

1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. The air conditioner is designed to circulate, filter, and cool or heat air in the room or enclosure in which it is installed.

b. This air conditioner has a capability of providing a maximum of 18,000 BTU/HR of cooling or 14,300 BTU/HR of heating. It is designed to automatically maintain the air in the room or enclosure at the desired temperature selected on the control panel.

c. The unit is self-contained in a single cabinet that is ideally suited for van or shelter type installations. The only external requirements are an external input power source, a

1-5. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES. -Continued

suitable ground and an entry to a suitable drain. The drain must be lower than the base of the cabinet, in its operating location, for disposal of condensate waste water. It is designed to operate in almost any environmental condition from artic to tropic and is fully portable for movement from one location to another.

d. The primary installation requirement is that the exhaust air from the compressor/condenser section must be vented to the outside atmosphere. This subject is fully covered in the installation instructions contained in Chapter 4, "Organizational Maintenance Instructions."

e. When using the F18H-3S in a secure area, caution must be exercised in meeting the established electromagnetic radiation standards. These standards may limit the use of the equipment's remote capability and require additional shielding for the ducts. The F18H-3SA and F18H-3SB are designed for installation of Electromagnetic Pulse (EMP) Kit (97403) 13228E2004.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

(See fig. 1-2 Sheets 1 and 2)

1 FABRIC COVER. Protects back or exposed side of the unit during periods of shut down. Must be rolled up when operating in the cool mode or when fresh (outside) air is being used in any mode.

2 CONDITIONED AIR SUPPLY LOUVER. Provides directional control of conditioned air.

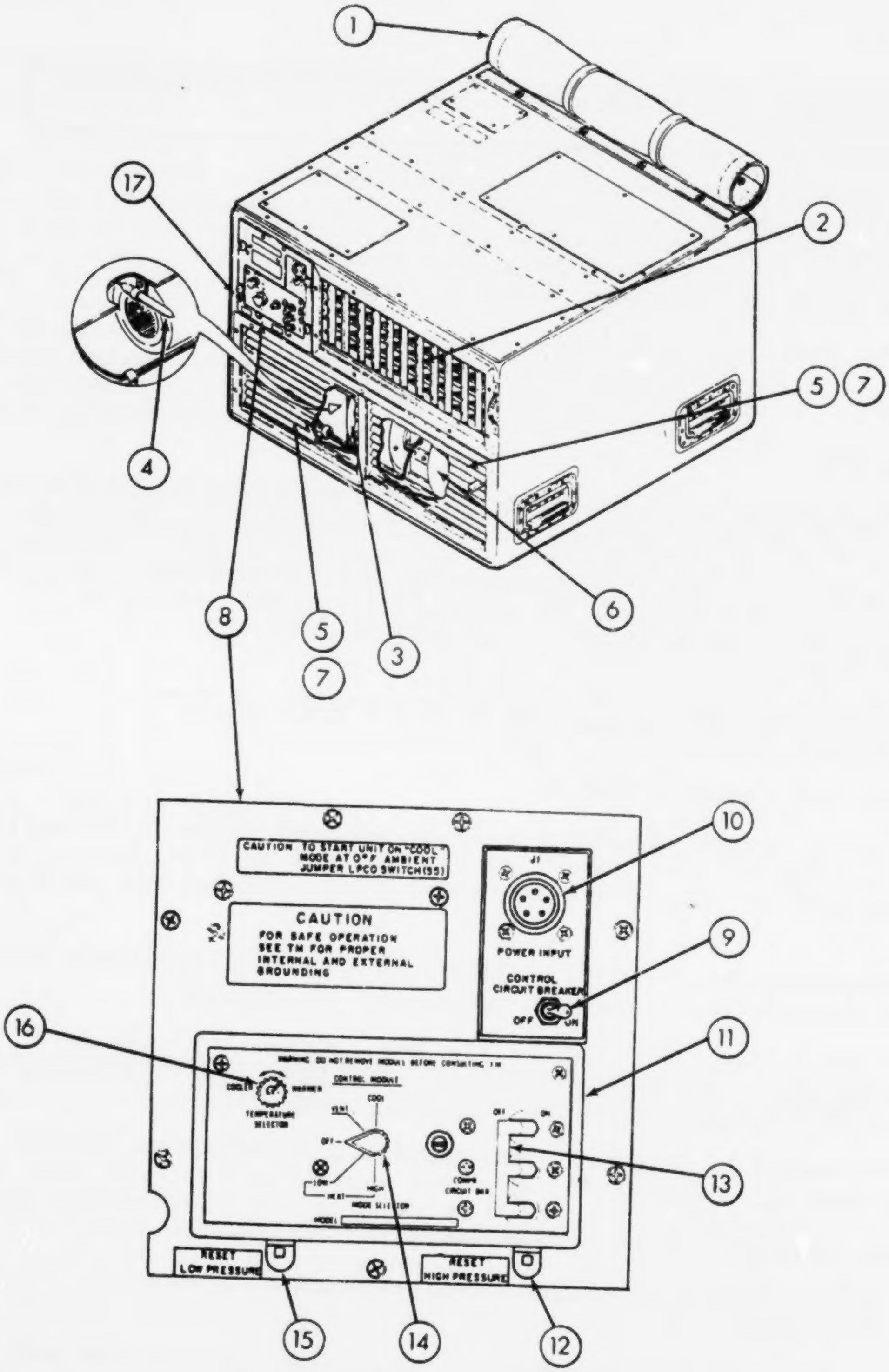
3 CONDITIONED (EVAPORATOR) AIR FAN. Draws the room or enclosure air in through the filter and blows it out over the evaporator and heaters to supply conditioned air.

4 TEMPERATURE SELECTOR (THERMOSTAT) SENSING BULB. Senses the temperature of the room or enclosure air as it is drawn back into the air conditioner. This bulb is part of the TEMPERATURE SELECTOR control (thermostat) that is located on the control panel module.

5 CONDITIONED AIR FILTER. Filters room or enclosure air as it is recirculated.

6 CONDITIONED AIR FAN MOTOR. Drives the conditioned air fans.

7 RETURN AIR LOUVER WITH FILTER CLAMPS. The recirculated air from the room or enclosure is drawn in through this louver. The conditioned air filter, item 5, is mounted on clips on the inside of this louver.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3
CAUTION TO START UNIT ON "COOL" MODE AT 0°F AMBIENT JUMPER LPCO SWITCH(55)
CAUTION
FOR SAFE OPERATION SEE TM FOR PROPER INTERNAL AND EXTERNAL GROUNDING
J1
POWER INPUT
CONTROL CIRCUIT BREAKER
OFF
ON
10
9
11
16
WARNING DO NOT REMOVE MODULE BEFORE CONSULTING TM
CONTROL MODULE
COOLER
WARMER
TEMPERATURE SELECTOR
COOL
VENT
OFF
LOW
HEAT
HIGH
MODE SELECTOR
COMPR CIRCUIT BKR
OFF
ON
MODEL
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RESET LOW PRESSURE
RESET HIGH PRESSURE
15
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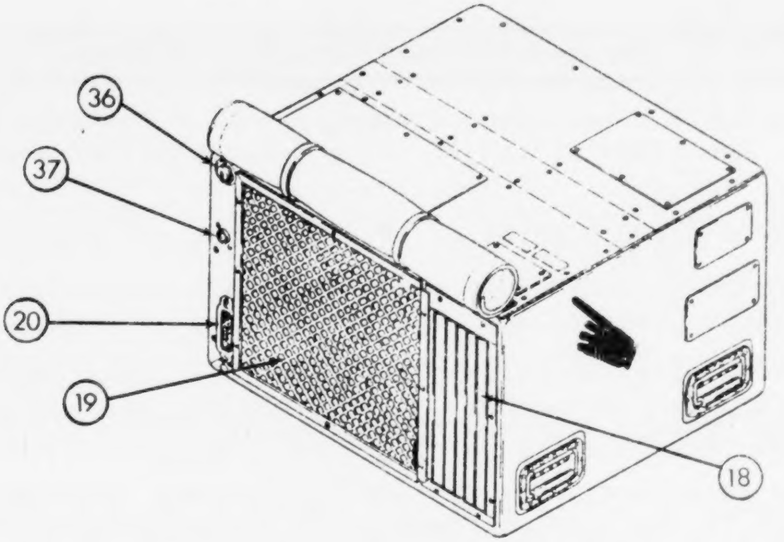
Figure 1-2. Location of Major Components (Sheet 1 of 2)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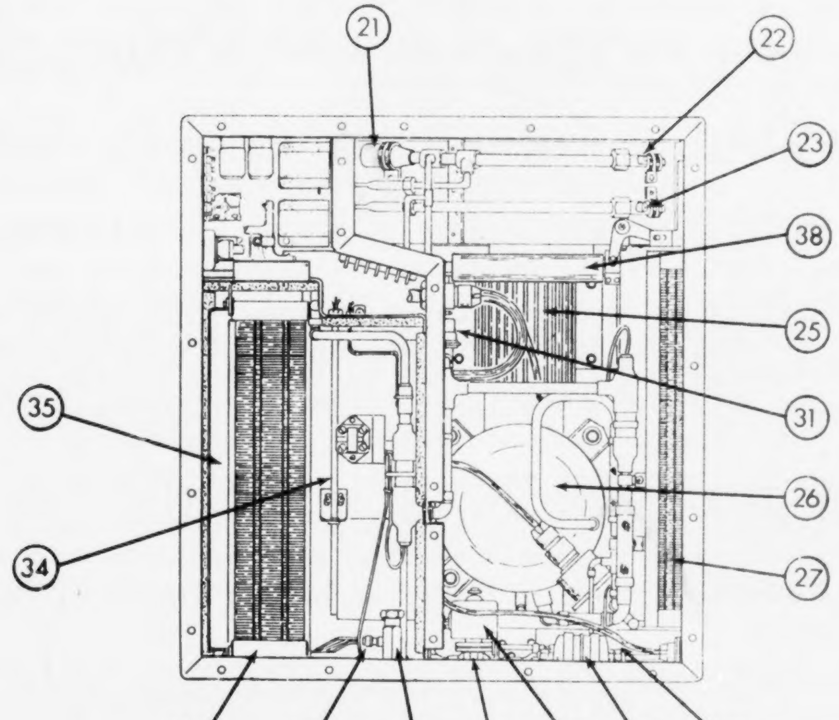
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Figure 1-2. Location of Major Components (Sheet 2 of 2)

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.-Continued

⑧ JUNCTION BOX AND CONTROL PANEL MODULE. Contains major unit controls. See items 9 thru 16 for a description of some of these controls.

⑨ CONTROL CIRCUIT BREAKER. Protects control circuit.

⑩ INPUT POWER RECEPTACLE (PRIMARY LOCATION). Connection point for main input power cable. See item 36 for alternate receptacle.

⑪ CONTROL PANEL MODULE. Contains switches and controls for operating the air conditioner. See items 13, 14, and 16 for a description of these switches and controls.

⑫ HIGH REFRIGERANT PRESSURE CUTOUT SWITCH. This switch is factory set to shut the compressor off if the refrigerant discharge line pressure rises to 435 to 455 psig (30.58 to 31.99 kg/cm^2).

NOTE

This switch must be hand reset after the pressure drops to 320 psig (22.50 kg/cm^2).

⑬ COMPR CIRCUIT BKR (Compressor Circuit Breaker). Protects the compressor.

⑭ MODE SELECTOR SWITCH. Allows selection of unit operating mode.

⑮ LOW REFRIGERANT PRESSURE CUTOUT SWITCH. This switch is factory set to shut the compressor off if the refrigerant suction line pressure drops to 10 to 20 psig (0.703 to 1.406 kg/cm^2). This switch must be hand reset after the pressure rises above 40 psig (2.812 kg/cm^2).

⑯ TEMPERATURE SELECTOR (THERMOSTAT) SWITCH. This switch allows selection of the desired temperature while operating in the cool or heat modes.

⑰ GROUND CONNECTION POINT. Shelter or van electrical ground connection point.

⑱ CONDENSER DISCHARGE AIR LOUVER ASSEMBLY. This louver assembly is automatically controlled by the actuating cylinder, item 38.

⑲ CONDENSER AIR INLET GUARD. This expanded metal screen protects the condenser from damage.

⑳ FRESH AIR VENTILATION GUARD. Screens and filters fresh air entering the unit.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.-Continued

NOTE

The air conditioner can be equipped for operation in chemical-biological-radiological (CBR) environment by connecting filtering equipment to the fresh air filter.

㉑ RELIEF VALVE. This safety valve opens when the refrigerant discharge line pressure rises above 540 psig (37.97 kg/cm^2).

㉒ CHARGING VALVE, REFRIGERANT SUCTION LINE. Provides a connection point for charging and checking suction line pressure.

㉓ CHARGING VALVE, REFRIGERANT DISCHARGE LINE. Provides a connection point for charging and checking discharge line pressure.

㉔ SOLENOID VALVE, PRESSURE EQUALIZING. This valve is normally open when the compressor is NOT running to equalize the pressure at the suction and discharge sides of the compressor. It closes when the compressor starts.

㉕ CONDENSER FAN AND MOTOR. This fan and motor draws outside air over the condenser coil to remove heat from the refrigerant passing through the tubes of the condenser coil.

㉖ COMPRESSOR. Consists of a reciprocating compressor driven by an electrical motor, hermetically sealed inside a steel container with a lifetime charge of oil. An external (crankcase) heater is attached to the lower part of the container. The purpose of the heater is to prevent possible damage to the compressor caused by liquid refrigerant accumulation in the cylinders during a period of shut down. The heater is connected directly to input power and is thermostatically controlled to prevent overheating.

㉗ CONDENSER COIL. Made up of interconnected parallel copper tubes retained in a series of multiple, closely spaced aluminum fins. This coil serves as a heat exchanger to remove the heat from the compressed refrigerant vapor so that it will condense into a liquid.

㉘ DEHYDRATOR, DESICCANT, REFRIGERANT (FILTER/DRIER). Removes moisture and contaminants from the refrigerant.

㉙ RECEIVER. The receiver acts as a storage tank for the liquid refrigerant.

㉚ SOLENOID VALVE, LIQUID LINE. This valve is normally open when the compressor is NOT running and is thermostatically controlled during cooling cycles when operating in the COOL mode.

1-6. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.-Continued

(31) PRESSURE REGULATING VALVES. These valves regulates the suction pressure by recirculating a part of the compressor discharge hot gas to the suction line when the suction pressure drops below a preset value. This action prevents frosting of the evaporator coil.

(32) EXPANSION VALVE. Meters refrigerant flow to the evaporator during cooling cycles when operating in the COOL mode.

(33) EVAPORATOR COIL. Similar in construction to the multiple-tube, finned condenser coil. This coil serves as a heat exchanger for the refrigerant to absorb heat from the room or enclosure air circulated through the evaporator section.

(34) HEATING ELEMENTS. Consists of two banks of heating elements. Only one bank operates in the "LOW HEAT" mode. Both banks operate in the "HIGH HEAT" mode. One bank shuts off when the thermostat is satisfied in both HIGH and LOW HEAT modes.

(35) MIST ELIMINATOR. The purpose of the mist eliminator is to trap droplets of condensed water from the evaporator, so that they will not be blown into the air conditioned space.

(36) INPUT POWER RECEPTACLE (ALTERNATE LOCATION). The main power cable may be connected here. See item 10 for primary location. See installation instructions for switch over instructions if this power receptacle is used.

(37) REFRIGERANT SIGHT GLASS. Visually indicates the condition of the refrigerant flowing in the refrigerant lines during cooling cycles when operating in the COOL mode.

(38) ACTUATING CYLINDER. This hydraulic cylinder operates discharge louver assembly. It will start to open the louver assembly at 150 to 180 psig (10.55 to 12.66 kg/cm^2) and fully open louver assembly at 220 to 260 psig (15.74 to 18.28 kg/cm^2) compressor discharge pressure to allow unit operation when outside temperature is low.

(39) RESTRICTOR. Divides the expanding refrigerant to three circuits of the evaporator coil.

1-6.1 DIFFERENCES BETWEEN MODELS

a. EMP unit differences

(1) Models F18H-3S and F18H-1S are not equipped to accept the Electromagnetic Pulse (EMP) Kit part number (97403) 13228E2004.

(2) Models F18H-3SA and F18H-3SB are equipped to accept EMP Kit part number (97403) 13228E2004.

(3) See fig. 1-1 for external appearance differences between these units.

NOTE

External illustrations throughout the remainder of this manual reflect the F18H-3S except where otherwise noted.

(4) Models F18H-3SA and F18H-3SB may be equipped with EMP Kit parts. See fig. 1-2.1 for identification of EMP Kit parts to determine if the air conditioner has been modified to include this kit.

b. Models F18H-3S, F18H-3SA and F18H-3SB units are 208 volt, 3 phase, 50/60 hertz powered units.

c. The Model F18H-1S unit uses 230 volt, single phase, 60 hertz power. This requires the addition of capacitors.

d. Models F18H-3S and F18H-1S are equipped with a service valve access cover.

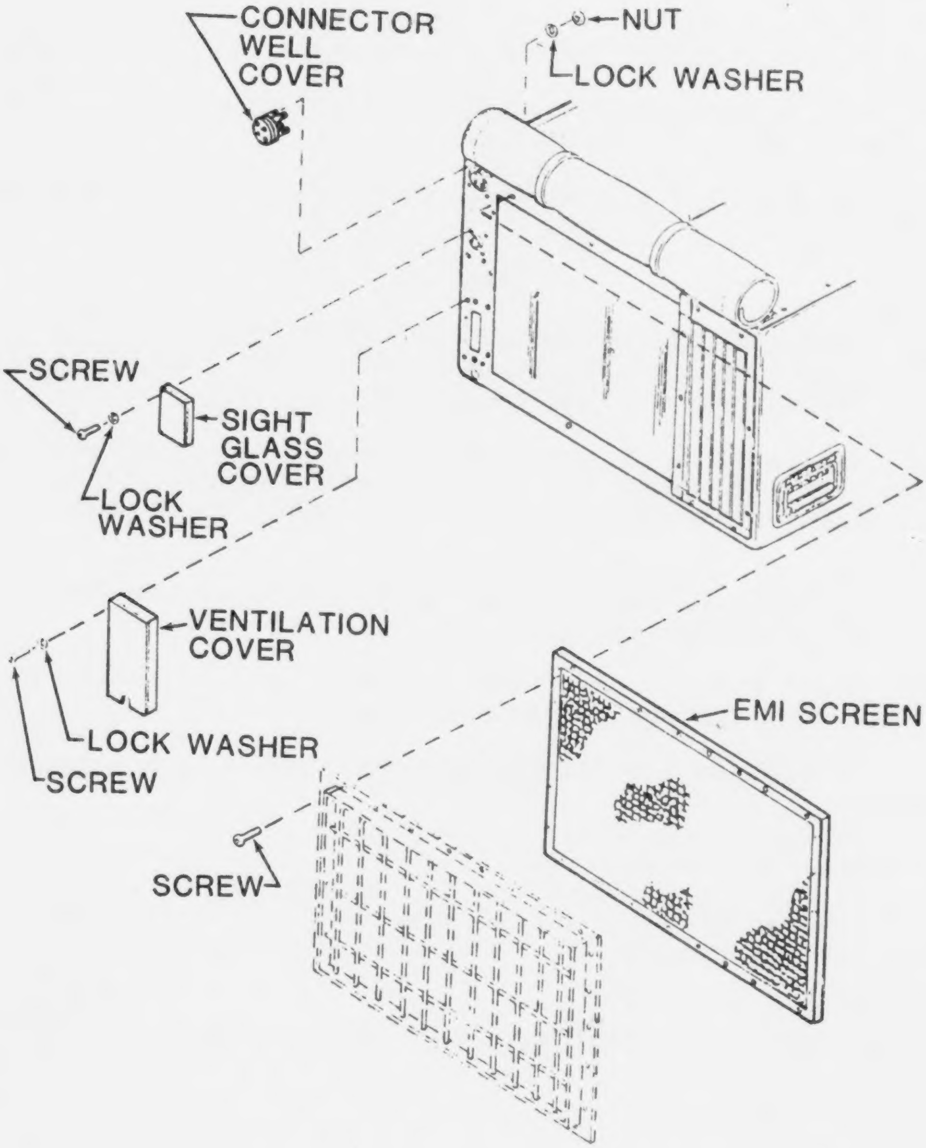
CONNECTOR
WELL
COVER
NUT
LOCK WASHER
SCREW
SIGHT
GLASS
COVER
LOCK
WASHER
VENTILATION
COVER
LOCK WASHER
SCREW
EMI SCREEN
SCREW

Figure 1-2.1 Electromagnetic Pulse (EMP) Kit Parts

1-7. EQUIPMENT DATA.

AMBIENT OPERATING TEMPERATURE RANGE		
LOW	-50°F (-45°C)	
HIGH	+125°F (+52°C)	
PERFORMANCE		
COOLING CAPACITY	18,000 BTU/HR	
HEATING CAPACITY	14,300 BTU/HR	
POWER REQUIRED	**Models F18H-3S, F18H-3SA and F18H-3SB**	**Model F18H-1S**
VOLTAGE	208	230
PHASE	3	Single
HERTZ	50/60	60
AMPERAGE	16	25
DIMENSIONS	**Models F18H-3S, F18H-3SA and F18H-3SB**	**Model F18H-1S**
WIDTH	30.0 inch (76.2 cm)	30.0 inch (76.2 cm)
DEPTH	28.0 inch (71.12 cm)	28.0 inch (71.12 cm)
HEIGHT	20.0 inch (50.8 cm)	20.0 inch (50.8 cm)
WEIGHT	265 pounds (120.2 kg)	275 pounds (124.7 kg)
REFRIGERANT		
TYPE	R-22	
CHARGE	3.6 pounds (1.63 kg) Carrier Compressor 2.8 pounds (1.27 kg) Keco Compressor	

Section III TECHNICAL PRINCIPLES OF OPERATION

1-8. REFRIGERATION CYCLE.

a. Cooling Cycle. (See fig. 1-3.)

- The COMPRESSOR (1) takes cold, low pressure refrigerant gas and compresses it to a high temperature, high pressure gas. This gas flows through the metal tubing to the SPLIT CONDENSER COIL (3A) and (3B) and RECEIVER (4).

FIND NO.	PART NO.	QTY	NOMENCLATURE
1	13211E3793	1	COMPRESSOR
2	13216E6167-1	1	HOSE ASSY, METAL
3A	13221E9358	1	COIL, CONDENSER WITH ANGLE
3B	FIND NO. 3A	1	SUB COOLER
4	13216E6163-2	1	RECEIVER, LIQUID REFRIGERANT
5	13216E6155	1	INDICATOR, SIGHT, LIQUID
6	13214E3557	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	13216E6172-1	1	SOLENOID VALVE, WITH LEADS
8	13216E6160-2	1	VALVE, EXPANSION (PRIMARY)
9	13216E6161	1	RESTRICTOR, FLUID FLOW
10	13216E6119	1	COIL, EVAPORATOR WITH ANGLE
11	13216E6166	2	BULB WELL
12	13216E6167-2	1	HOSE ASSY, METAL
13	13216E6168	2	VALVE, CHARGING, WITH CAP
14	13211E8369	1	VALVE, PRESSURE RELIEF
15	13216E6128	1	CYLINDER ASSY, ACTUATING, LINEAR
16	13216E6215-3	1	SWITCH, PRESSURE (HIGH)
17	13216E6174-2	1	VALVE, EXPANSION (QUENCH)
18	13216E6172-2	1	SOLENOID VALVE, WITH LEADS
19	13216E6171	2	REGULATOR, FLUID PRESSURE
20	13216E6215-1	1	SWITCH, PRESSURE (LOW)

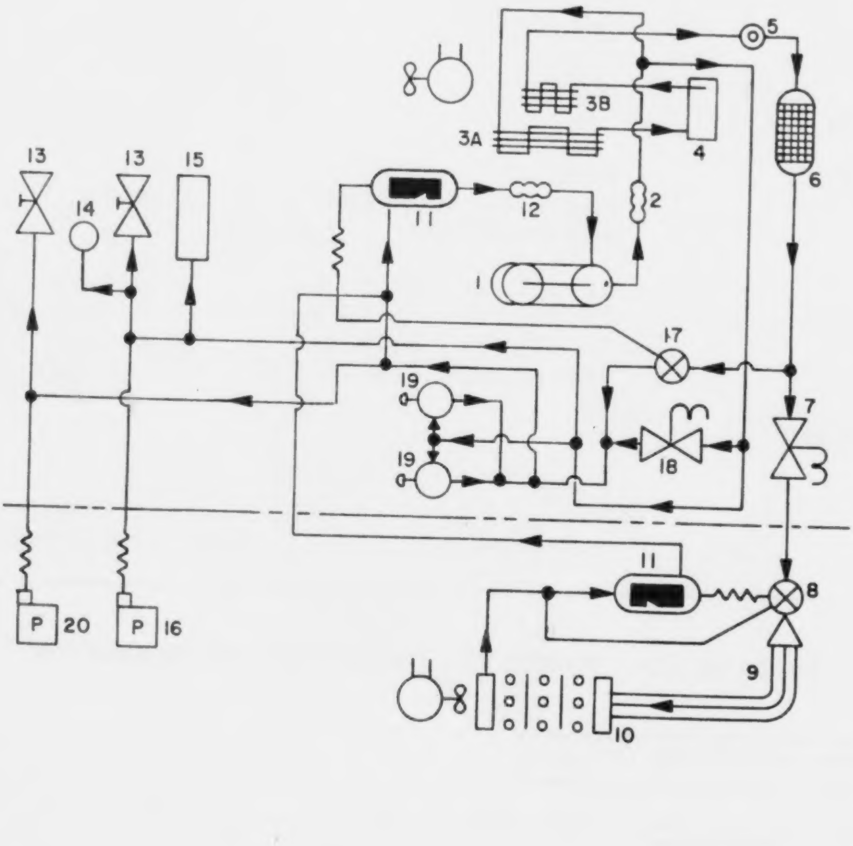

Figure 1-3. Refrigeration Schematic

1-8. REFRIGERATION CYCLE.-Continued

- The condenser fan draws outside ambient air over and through the two section CONDENSER COIL (3A) and (3B). The high temperature, high pressure gas from the COMPRESSOR (1) is cooled by the flow of air and is changed into a high pressure liquid.

- The LIQUID SIGHT GLASS (5) indicates the presence of moisture and quantity of refrigerant in the system.

- The DEHYDRATOR, DESICCANT, REFRIGERANT (filter/drier) (6) removes any moisture (water vapor) or dirt that may be carried by the liquid refrigerant.

- The SOLENOID VALVE (7) is controlled by the TEMPERATURE SELECTOR on the control panel. This valve will shut off the flow of refrigerant to the evaporator section when the temperature in the conditioned area reaches the set point.

- The EXPANSION VALVE (8) controls the amount and pressure of liquid refrigerant to the EVAPORATOR COIL (10). The EXPANSION VALVE (8) senses the temperature and pressure of the refrigerant as it leaves the evaporator coil. By use of the sensing bulb in the BULB WELL (11) and an "external equalizer line" the valve constantly adjusts the flow of liquid refrigerant to the EVAPORATOR COIL (10).

- As the liquid refrigerant leaves the EXPANSION VALVE (8) it passes through the RESTRICTOR (9) which divides the refrigerant for the three separate circuits of the EVAPORATOR COIL (10). As the high pressure liquid enters the coil the larger size tubing causes a sudden reduction in pressure. This reduction in pressure and the warmer air being forced across the tubes of the coil cause the refrigerant to boil or "flash" to a gas. The evaporator blower circulates the warm air from the conditioned space over and through the evaporator coil. Liquid absorbs heat when it changes from a liquid to a gas. As air from the conditioned spaces comes in contact with the EVAPORATOR COIL (10), the air is cooled.

- To prevent compressor overload and damage during start-up, SOLENOID VALVE (18) is open at start of cooling cycle to equalize pressure on both sides of the compressor.

1-8. REFRIGERATION CYCLE.-Continued

b. Bypass System. This unit has a bypass system which allows cooling operation at low cooling loads without cycling the compressor on and off. In bypass the refrigerant is piped from the discharge to the suction side of the compressor, bypassing the EVAPORATOR COIL (10).

- When the TEMPERATURE SELECTOR on the control module senses that cooling conditions have reached the set point, it closes the SOLENOID VALVE (7) to shut off refrigerant flow to the EVAPORATOR COIL (10).
- As the compressor suction pressure starts to drop, the PRESSURE REGULATORS (19) open to allow flow of hot gas from the compressor.
- The QUENCH VALVE (17) senses the temperature of the gas at the suction side of the compressor. To prevent excessively hot gas from reaching the compressor the QUENCH VALVE (17) opens to allow liquid refrigerant to mix with the hot gas.
- The LINEAR ACTUATING CYLINDER ASSEMBLY (15) automatically controls the condenser discharge louver assembly.
- The SERVICE VALVES (13) are provided for charging, and general servicing of the high and low pressure sides of the refrigerant system.
- The LOW PRESSURE SWITCH (20), the HIGH PRESSURE SWITCH (16) and the PRESSURE RELIEF VALVE (14) are provided to protect the unit from damage due to pressure extremes.
- The flexible METAL HOSE ASSEMBLIES (2) and (12) provide vibration isolation between the compressor and other components of the refrigeration system.

1-9. HEATING.

When the MODE SELECTOR is set for HIGH heat, all six heating elements, located behind the evaporator coil are energized. These elements are protected from overheating by a thermal cutout switch. Half of the elements are thermostatically controlled by the TEMPERATURE SELECTOR. The remaining half are on all of the time. When set for LOW, only the thermostatically controlled elements are energized.

CHAPTER 2

OPERATING INSTRUCTIONS

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Operator's Controls.......................... 2-2
Indicators................................... 2-3
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General...................................... 2-4
Operation Under Usual Conditions............. III
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Operational Checks......................... 2-6
General Operating Procedures............... 2-7
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Section I DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. GENERAL.

The air conditioner is designed for a wide variety of installations and for operation under a wide range of climatic conditions. It is also designed for continuous or intermittent operation as a self-contained unit or may be connected to external filtering equipment for operation under chemical-biological-radiological (CBR) environmental conditions. Operators must be aware of any peculiarities or operational limitations for their specific installation.

2-2. OPERATOR'S CONTROLS.

All necessary operator controls are illustrated in Figures 2-1 and 2-2. Usage of controls is detailed in Operational Checks (para 2-6).

CAUTION

Under normal operating conditions, before starting the air conditioner in any mode, make sure that the fabric cover on the back of the cabinet is rolled up and secured, that the condenser fan intake screen and fan guard are in place and unobstructed, and that the evaporator fan intake and discharge grille louvers are fully open. EXCEPTIONS: Under extreme climatic conditions, such as blowing snow, which might enter the compressor section, the unit may be operated in the VENTILATE, LO HEAT or HI HEAT mode with the fabric cover rolled down and snapped in place. When operated in this manner, outside air cannot be drawn through the fresh air damper, which should be positioned fully closed. The fabric cover cannot be rolled down if the unit is connected to a CBR filter.

DO NOT OPERATE IN THE COOL MODE WITH THE FABRIC COVER ROLLED DOWN. DAMAGE TO THE EQUIPMENT MAY RESULT IF PERSONNEL FAIL TO OBSERVE PRECAUTIONS.

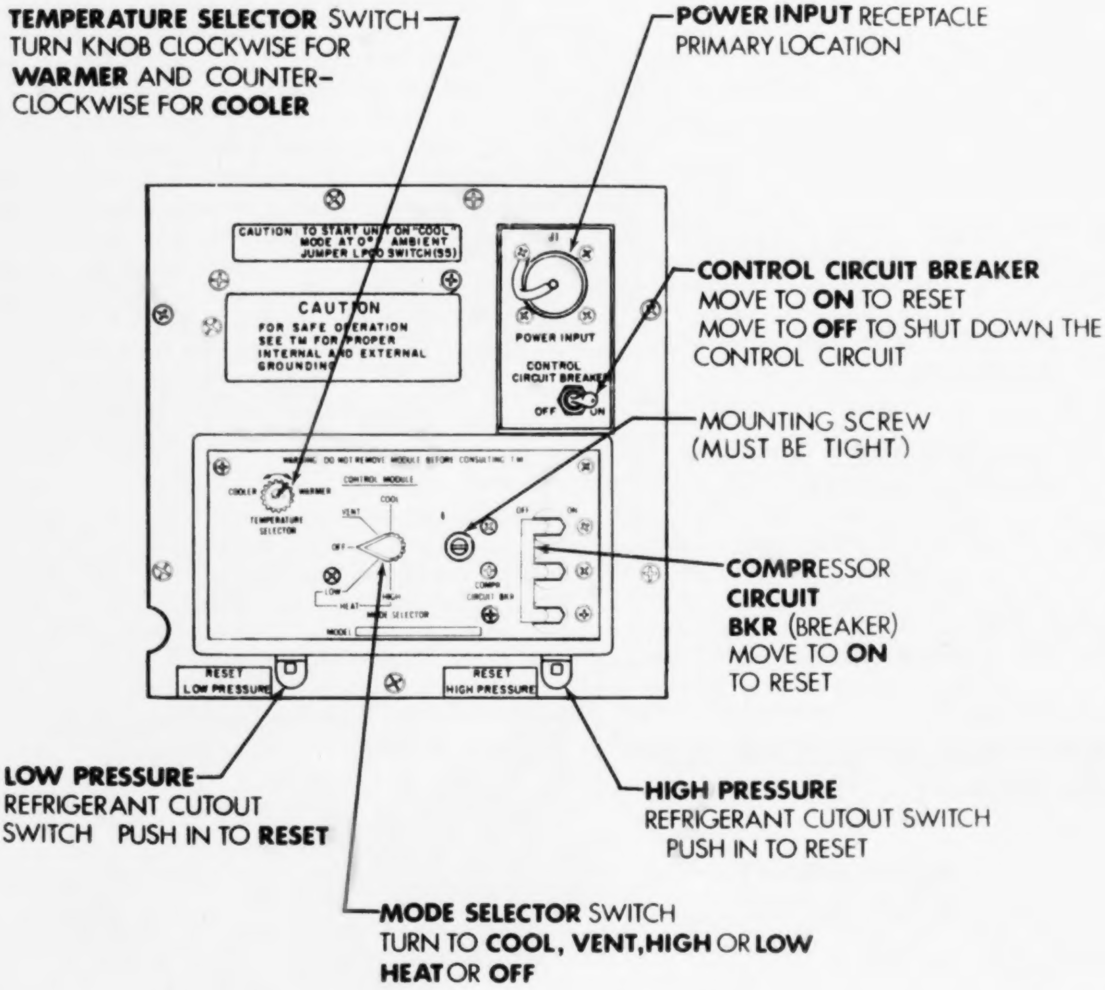
TEMPERATURE SELECTOR SWITCH
TURN KNOB CLOCKWISE FOR **WARMER** AND COUNTER-CLOCKWISE FOR **COOLER**
POWER INPUT RECEPTACLE PRIMARY LOCATION
CAUTION TO START UNIT ON "COOL" MODE AT 0°F AMBIENT JUMPER LPCO SWITCH(S5)
CAUTION
FOR SAFE OPERATION SEE TM FOR PROPER INTERNAL AND EXTERNAL GROUNDING
J1
POWER INPUT
CONTROL CIRCUIT BREAKER
OFF
ON
CONTROL CIRCUIT BREAKER
MOVE TO **ON** TO RESET
MOVE TO **OFF** TO SHUT DOWN THE CONTROL CIRCUIT
MOUNTING SCREW (MUST BE TIGHT)
WARNING DO NOT REMOVE MODULE BEFORE CONSULTING TM
CONTROL MODULE
COOLER
WARMER
TEMPERATURE SELECTOR
VENT
COOL
OFF
LOW
HEAT
HIGH
MODE SELECTOR
COMPR CIRCUIT BKR
OFF
ON
MODEL
COMPRESSOR **CIRCUIT** **BKR** (BREAKER) MOVE TO **ON** TO RESET
RESET LOW PRESSURE
RESET HIGH PRESSURE
LOW PRESSURE REFRIGERANT CUTOUT SWITCH PUSH IN TO **RESET**
HIGH PRESSURE REFRIGERANT CUTOUT SWITCH PUSH IN TO RESET
MODE SELECTOR SWITCH
TURN TO **COOL, VENT, HIGH** OR **LOW HEAT** OR **OFF**

Figure 2-1. Operator's Controls and Indicators

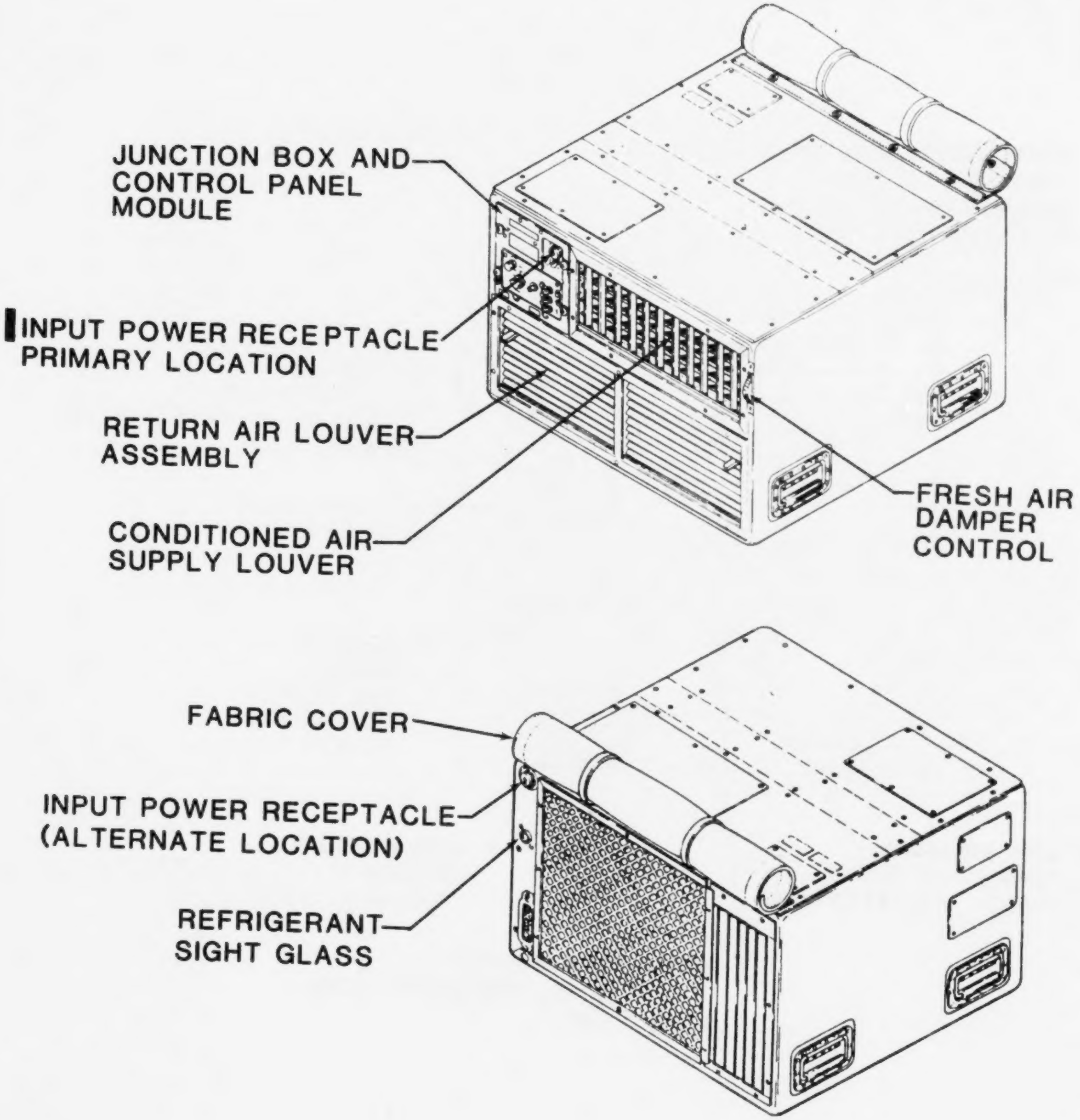
JUNCTION BOX AND CONTROL PANEL MODULE
INPUT POWER RECEPTACLE PRIMARY LOCATION
RETURN AIR LOUVER ASSEMBLY
CONDITIONED AIR SUPPLY LOUVER
FRESH AIR DAMPER CONTROL
FABRIC COVER
INPUT POWER RECEPTACLE (ALTERNATE LOCATION)
REFRIGERANT SIGHT GLASS

Figure 2-2. Operator's Controls and Indicators

2-3. INDICATORS.

(See fig. 2-2.)

The refrigerant sight glass is the only visual indicator incorporated in the air conditioner. The refrigerant sight glass has a small chamber with a glass window through which the refrigerant condition can be observed. It is installed in the liquid refrigerant line downstream from the condenser coil. Liquid refrigerant actually flows through the sight glass chamber only during cooling cycles when the air conditioner is in operation in the COOL mode. The unit must be operated approximately 15 minutes at maximum cooling prior to checking condition of refrigerant at sight glass. The sight glass is equipped with a center indicator that is moisture sensitive. Dry refrigerant is indicated by the color green, which changes to chartreuse when the moisture content becomes undesirable, and to yellow when the level becomes unacceptable. Excessive moisture in the refrigerant may damage or possibly destroy the compressor. If the liquid refrigerant observed in the sight glass has a milky appearance, or if frequent bubbles appear, the volume of refrigerant is low and the system should be charged. Moisture or low charge indications should be reported to direct support maintenance for appropriate refrigeration system action.

CAUTION

Do not operate the air conditioner in the COOL mode if the refrigerant color has reached the yellow band or if numerous bubbles appear in the sight glass. COOL mode operation may be continued with the refrigerant color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse. Damage to the equipment may result if personnel fail to observe precautions.

Section II PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-4. GENERAL.

Preventive maintenance checks and services (PMCS) are essential to the efficient operation of the air conditioner and to prevent possible damage that might occur through neglect or failure to observe warning symptoms in a timely manner. Checks and services performed by operators are limited to those functions which can be accomplished from the outside of the cabinet.

a. Before You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS contained in this technical manual and plates installed on the equipment that are associated with the functions you are about to perform. Perform your before (B) PMCS from Table 2-1.

b. While You Operate. Always keep in mind and observe the WARNINGS and CAUTIONS contained in this technical manual and plates installed on the equipment that are associated with operational functions. Perform your during (D) PMCS from Table 2-1.

c. After You Operate. Be sure to perform your after (A) PMCS from Table 2-1.

d. If Your Equipment Fails to Operate. Troubleshoot within your capabilities and with proper equipment. Report any deficiencies as appropriate using the proper form as specified in DA Pamphlet 738-750.

NOTE

Within designated intervals, these checks are to be performed in the order listed.
If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - Before
D - During
A - After
W - Weekly
M - Monthly

Item No.	Interval					Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary.	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
1	●					Information plates	Check for legibility and loose or missing hardware.	
2	●					Fabric Cover	Check that cover is rolled up for normal operation.	
					●		Roll down cover and check for condition of snaps, mildew, tears or worn edges.	Cover is missing or damaged.
3	●					Panels	Check for cracks, dents, or missing hardware.	Panels missing or damaged.
4	●					Screens and Guards	Check for obstructions, damage, loose or missing hardware.	Screens or guard damaged or missing.
5	●					Louvers	Check for obstructions, damage, proper adjustment, loose or missing hardware.	Louvers are damaged or missing.
					●		Check louvers for freedom of operations. Lubricate as required.	

Table 2-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES-Continued

Item No.	Interval					Item To Be Inspected	Procedures Check for and have repaired or adjusted as necessary.	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
6	●	●	●		●	Air Filter	Check that filter is clean.	Filter is totally clogged or missing.
7	●					Fresh Air Damper	Check for proper adjustment.	
					●		Freedom of operation.	Control wheel missing or inoperable.
8		●				Condensate Drain	No water dripping anywhere except drain.	Water is leaking in an area that would cause damage or be a hazard.
9	●					Control Module	Inspect for damage, secure mounting, and proper operation in accordance with paragraph 2-6.	Control module damaged or operating improperly.
10		●				Refrigerant Sight Glass	After 15 minutes of operation in maximum cooling, check for bubbles or milky flow indicating low refrigerant charge. Check for yellow color which indicates presence of moisture.	Bubbles, milky flow, or yellow color is observed.

Section III OPERATION UNDER USUAL CONDITIONS.

2-5. ASSEMBLY AND PREPARATION FOR USE.

The air conditioner is a completely assembled, self-contained unit as received. No specific operator preparation for use is required once the unit is in place.

2-6. OPERATIONAL CHECKS.

(See fig. 2-1 and 2-2.)

The air conditioner should be checked for operation in all modes after installation is completed and when it is to be placed back in operation after an extended shut down period.

CAUTION

> Do not perform the operational check in COOL mode until input power has been supplied to the unit for at least four hours. Liquid refrigerant tends to migrate into the compressor crankcase and cylinders during periods when the compressor heater is not operating. Under moderate climatic conditions, the compressor heater will normally "boil" all liquid refrigerant out within a four hour period. If the air conditioner has been exposed to below freezing temperatures without input power, an eight hour warm up period is recommended.

a. Unsnap and roll up the fabric cover on the back of the cabinet. Secure it in the stowed position with the two straps.

b. Individually adjust all louvers in conditioned air supply louver assembly to the fully open (horizontal) position.

c. Using the operating levers, adjust the louvers in both sections of the return air louver assembly to the fully open position.

d. Turn the fresh air damper control to the fully closed (up) position.

e. Check that the unit is connected to the proper power source and that power has been connected to the unit for four hours.

f. Check to see that the CONTROL CIRCUIT BREAKER and the COMPR CIRCUIT BKR are in the ON position.

2-6. OPERATIONAL CHECKS.-Continued

g. Turn the MODE SELECTOR switch to VENT (ventilate). The evaporator fan should start immediately. Use a paper streamer or other method to check the airflow into the return air louver and out of the conditioned air supply louver.

h. To check maximum ventilation with fresh air, first turn the fresh air damper control wheel to fully open (down) then adjust the louvers in both sections of the return air louver fully closed. Check the fresh air inlet located on the lower left corner of the back of the unit using a paper streamer or other method to be sure that air is being drawn in.

NOTE

For maximum ventilation with fresh air, it is necessary that room or enclosure air have a means of exit through an open door or window. If the room or enclosure is tightly closed, an overpressure will build up and decrease the volume of fresh air drawn in.

i. Fully open the return air louvers and fully close the fresh air damper.

j. Turn the TEMPERATURE SELECTOR (thermostat) knob to the full WARMER (clockwise) position. Then turn the MODE SELECTOR switch to LOW HEAT. Place your hand in the airflow from the conditioned air supply louver and feel for a temperature rise. When the supply air temperature has reached a relatively stable level, turn the MODE SELECTOR switch to HIGH HEAT and feel for a further temperature rise. Next, turn the TEMPERATURE SELECTOR thermostat control knob to the fully COOLER (counterclockwise) position. Feel that supply air temperature drops to approximately the same relatively stable level previously noted in LOW HEAT. Finally, turn the MODE SELECTOR switch to LOW HEAT and feel the discharge air temperature drop to ambient level (room temperature).

NOTE

The temperature thermostat control has an effective functional range between 60°F and 90°F (16°C and 32°C). In extreme conditions when ambient air temperature is below 60°F (16°C) or above 90°F (32°C), the operation in either LOW HEAT or HIGH HEAT mode will vary from that described above.

2-6. OPERATIONAL CHECKS.-Continued

CAUTION

If a knocking or pounding noise is heard when the compressor starts in the following check, immediately turn the MODE SELECTOR out of the COOL position. Leave input power connected and wait at least two hours before attempting another start in COOL mode. Damage to equipment may result if personnel fail to observe precautions.

k. Turn the TEMPERATURE SELECTOR control knob to the fully WARMER (clockwise) position, then turn the MODE SELECTOR switch to COOL. Note that the evaporator and condenser fans start immediately and that the compressor starts approximately 30 seconds later. Hold your hand in the airflow from the conditioned air supply louver; there should be no change in temperature. Now turn the TEMPERATURE SELECTOR control knob to the fully COOLER (counterclockwise) position and feel the supply air temperature begin to drop almost immediately. Leave controls in the present position and perform the next check.

l. After 15 minutes of operation check the sight glass to determine the refrigerant condition. The sight glass is equipped with a center indicator that is moisture sensitive. Dry refrigerant is indicated by green, it turns to chartreuse when the moisture content becomes undesirable, and to yellow when the level becomes unacceptable. Excessive moisture in the refrigerant may damage or possibly destroy the compressor. If the liquid refrigerant observed in the sight glass has a milky appearance, or frequent bubbles appear, the volume of refrigerant is low and the system should be charged. Either moisture or low charge indications should be reported to direct support maintenance for appropriate refrigeration system action.

CAUTION

Do not operate the air conditioner in the COOL mode if the refrigerant color has reached the yellow band or if numerous bubbles appear in the sight glass. COOL mode operation may be continued with the refrigerant color in the chartreuse band or with only an occasional bubble appearing in the window, but the sight glass should be rechecked after each four hours of operation to insure that the condition has not become worse. Damage to the equipment may result if personnel fail to observe precautions.

m. Turn the MODE SELECTOR switch to OFF. Observe that all air conditioner functions cease.

2-7. GENERAL OPERATING PROCEDURES.

The air conditioner is designed for operation in a wide range of climatic conditions either continuously or intermittently. The amount of operator attention required will vary depending on specific local conditions for each installation. Under usual conditions, the air conditioner will be set up for the appropriate mode of operation at the beginning of a season and will only need starting and stopping and minor adjustments for the rest of the season. Table 2-2 provides the recommended initial control settings to establish the desired mode of operation. Minor adjustments may be required to obtain the desired mixture of recirculated and fresh air and the airflow patterns of conditioned air.

NOTE

> Under some climatic conditions, local practices may be established to close the fresh air damper and/or roll down and snap in place the fabric cover during shutdown periods. If such practices are in effect, the operator must first unsnap, roll up, and secure the fabric cover and appropriately adjust the fresh air damper before turning the MODE SELECTOR switch to the desired operating mode.

Table 2-2 INITIAL OPERATOR CONTROL SETTINGS

Mode	Mode Selector	Temperature Selector	Fresh Air Damper	Return Air Louver	Conditioned Air Supply Louver	Fabric Cover
Ventilation with 100% Recirculated Air	VENT	Any Setting	Fully Closed	Fully Open	Optional	Optional
Ventilation with make-up Fresh Air	VENT	Any Setting	Partially Open	Partially Closed	Optional	Open (Rolled)
Ventilation with 100% Fresh Air	VENT	Any Setting	Fully Open	Fully Closed	Optional	Open (Rolled)
Heating with 100% Recirculated Air	LOW HEAT or HIGH HEAT	Desired Temperature	Fully Closed	Fully Open	Slightly Downward	Optional
Heating with make-up Fresh Air	LOW HEAT or HIGH HEAT	Desired Temperature	Partially or Fully Closed	Partially or Fully Closed	Slightly Downward	Open (Rolled)
Cooling with 100% Recirculated Air	COOL	Desired Temperature	Fully Closed	Fully Open	Slightly Upward	Open (Rolled)
Cooling with make-up Fresh Air	COOL	Desired Temperature	Partially or Fully Open	Partially or Fully Closed	Slightly Upward	Open (Rolled)
Any Mode - with make-up Air Through CBR Filter	Desired Mode	Desired Temperature	Fully Open	Partially or Fully Closed	Optional	Open (Rolled)

2-8. INFORMATION PLATES.

A number of information plates are provided on the exterior of the air conditioner cabinet. These plates are located on, or adjacent to, the control or device to which they apply. See figure 2-3 for locations and printed information.

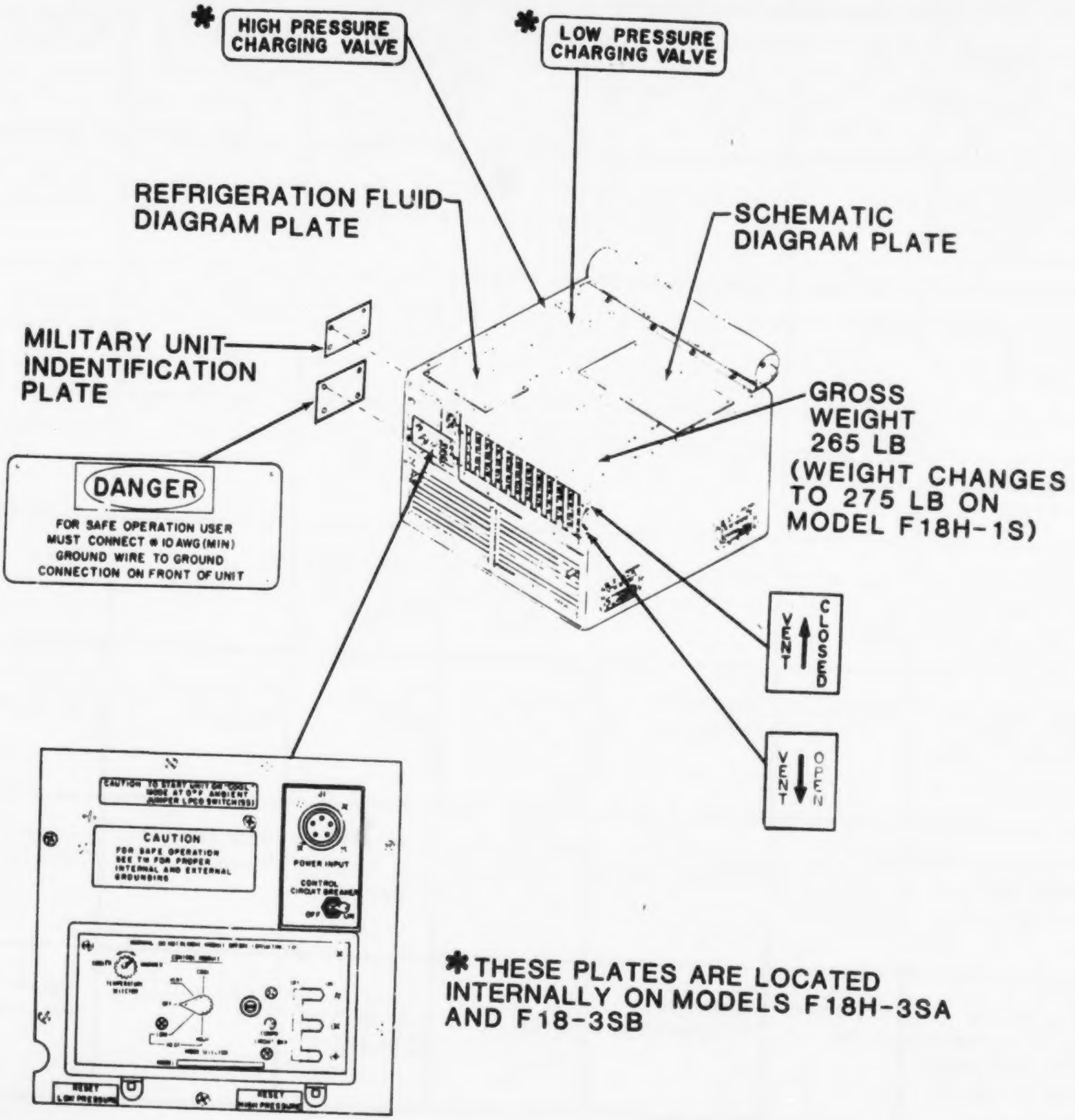
* HIGH PRESSURE CHARGING VALVE
* LOW PRESSURE CHARGING VALVE
REFRIGERATION FLUID DIAGRAM PLATE
SCHEMATIC DIAGRAM PLATE
MILITARY UNIT INDENTIFICATION PLATE
GROSS WEIGHT 265 LB (WEIGHT CHANGES TO 275 LB ON MODEL F18H-1S)
DANGER
FOR SAFE OPERATION USER MUST CONNECT # 10 AWG (MIN) GROUND WIRE TO GROUND CONNECTION ON FRONT OF UNIT
VENT CLOSED
VENT OPEN
CAUTION TO START UNIT ON "COOL" MODE AT 0°F AMBIENT JUMPER LPCO SWITCH(S5)
CAUTION
FOR SAFE OPERATION SEE TM FOR PROPER INTERNAL AND EXTERNAL GROUNDING
J1
POWER INPUT
CONTROL CIRCUIT BREAKER
OFF
ON
RESET LOW PRESSURE
RESET HIGH PRESSURE
* THESE PLATES ARE LOCATED INTERNALLY ON MODELS F18H-3SA AND F18-3SB

Figure 2-3. Instruction Plates, Stencil Marking Information, and Locations

2-9. PREPARATION FOR MOVEMENT.

No special operator preparation is required when the air conditioner is to be moved to another location.

a. Close the louvers in the evaporator intake and discharge grilles.

b. Close the fresh air damper.

c. Roll the fabric cover down and snap it in place to the back of the cabinet.

Section IV OPERATION UNDER UNUSUAL CONDITIONS

2-10. GENERAL.

The air conditioner is designed to operate normally within a wide range of climatic conditions. However, some extreme conditions require special operating and servicing procedures to prevent undue loading and excessive wear on the equipment.

2-11. OPERATION IN EXTREME HEAT.

The air conditioner is designed to operate in temperatures up to 125°F (52°C). Extra care should be taken to minimize the cooling load when operating in extremely high temperatures. Some of the steps that may be taken are:

a. Check all openings in the enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.

b. When appropriate use shades or awnings to shut out direct rays of the sun.

c. When possible limit the use of electric lights and other heat producing equipment.

d. Limit the amount of hot, outside air introduced through the fresh air damper to that essential for ventilation.

2-11. OPERATION IN EXTREME HEAT.-Continued

NOTE

Weatherstripping, the installation of storm doors, and windows, if appropriate, and insulation of surfaces exposed to the outside is recommended when operating in extremely high temperatures for extended periods is anticipated.

e. Clean filter, mist eliminator, and coils more frequently.

2-12. OPERATION IN EXTREME COLD.

CAUTION

Do not disturb electrical wiring that has been exposed to extremely low temperatures. Both the wire and insulation become brittle when cold and are easily broken.

The air conditioner is designed to operate in the HEAT mode at temperatures down to -50°F (-45°C) and in the COOL mode at outside temperatures down to 0°F (-18°C). Extra care should be taken to minimize the heating load when operating in extremely low temperatures. Some of the steps that may be taken are:

a. Check all openings in the enclosure, especially doors and windows, to be sure they are tightly closed. Limit in and out traffic, if possible.

b. Open shades and awnings to permit entry of direct rays of the sun, if appropriate.

c. Limit the amount of cold, outside air introduced through the fresh air damper to that essential for ventilation.

NOTE

Weather stripping, the installation of storm doors, and windows, if appropriate, and insulation of surfaces exposed to the outside is recommended when operation at extremely low temperatures for extended periods is anticipated.

d. Before attempting to start the unit in the COOL mode or when fresh air is being used during the HEAT mode, be sure that cover is rolled up and all exposed air openings are clear of ice and snow.

2-12. OPERATION IN EXTREME COLD.-Continued

e. When the unit is to be used at low temperatures in the COOL mode, the low refrigerant pressure cutout switch must be jumpered. Contact organizational maintenance. (See para 4-38.)

f. Be sure that all dampers are operating freely.

g. If unit is not being used or is being used in the HEAT mode without fresh air, close (roll down) and secure the fabric cover.

2-13. OPERATION IN DUSTY OR SANDY CONDITIONS.

Dusty and sandy conditions can seriously reduce the efficiency of the air conditioner by clogging the air filter, mist eliminator, and coils. This will cause a restriction in the volume of airflow. Accumulation of dust or sand in the condenser coil and/or in the compressor compartment may cause overheating of the refrigeration system. Dust or sand may also clog the condensate trap and water drain lines. Some of the steps that may be taken are:

a. Frequent cleaning of filters, mist eliminator, coils and all other areas of dust and sand accumulation. In extreme conditions, daily cleaning of filters may be necessary.

b. Limit the amount of dusty or sandy outside air introduced through the fresh air damper to that essential for ventilation.

c. Roll down and secure the fabric cover on the back of the cabinet during periods of shutdown.

2-14. OPERATION IN UNUSUALLY WET CONDITIONS.

The air conditioner is designed for normal exposure to the elements, so it is reasonably waterproof. Some of the steps that should be taken in an extremely wet climate are:

a. More frequent inspection and cleaning of the mist eliminator, condensate trap, and drain lines to insure proper drainage and prevent accumulation of water inside the cabinet.

b. Roll down and secure the fabric cover on the back of the cabinet during periods of wet, windy weather when the air conditioner is not in operation.

c. Roll up and secure the fabric cover during dry weather when the air conditioner is not in operation so that the interior can dry out and condensation will not accumulate.

2-15. OPERATION IN SALT AIR OR SEA SPRAY.

Salt air or sea spray may cause many of the same clogging problems as encountered when operating in a dusty or sandy environment. In addition, the nature of salt presents serious corrosion problems. Some of the steps that should be taken when operating in a salt air or sea spray environment are:

a. Frequent cleaning during which all exposed surfaces should be thoroughly spray rinsed or sponged with fresh water to remove salt deposits.

b. Roll down and secure the fabric cover on the back of the cabinet during all periods when the air conditioner is not in operation.

2-16. OPERATION UNDER EMERGENCY CONDITIONS.

a. CBR Hazard. When operation is anticipated under potential chemical-biological-radiological (CBR) conditions, a CBR filtering unit should be connected to the fresh air intake. It may be necessary to remove the guard and fabricate a special adapter for this connection. Adjust the return air louvers in conjunction with the CBR filter controls to provide a higher overpressure within the room or enclosure.

b. Power Conservation. During periods when full electrical power is in critically short supply, if the air conditioner cannot be turned off completely, it should be operated in VENTILATE mode only when possible.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

	Section/Paragraph
Lubrication Instructions......................	I
General.....................................	3-1
Troubleshooting................................	II
Use of Troubleshooting Table................	3-2

Section I LUBRICATION INSTRUCTIONS

3-1. GENERAL.

The air conditioner and its major components are designed so that very little lubrication is required during their serviceable lifetime. The refrigerant compressor and its drive motor are hermetically sealed in a single canister; sealed bearings are incorporated in the drive motor and the **compressor is supplied with a complete charge of oil and requires no lubrication.** Sealed bearings are incorporated in the evaporator and condenser fan motors. Report stiffness or binding of all other operational controls to organizational maintenance for appropriate action.

Section II TROUBLESHOOTING

3-2. USE OF TROUBLESHOOTING TABLE.

Table 3-1 contains troubleshooting information useful to operators in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. The Troubleshooting Table lists the common malfunction symptoms operators are most likely to encounter during operation of the air conditioner; test and inspection steps to be followed to determine the cause; and the corrective action that should be taken for each possible cause listed.

3-2. USE OF TROUBLESHOOTING TABLE.-Continued

b. The operator should first find the malfunction symptom which most closely describes the immediate situation. Then perform the test, inspection, and corrective action steps in the order in which listed.

c. This manual cannot list all possible malfunction symptoms that may be encountered, nor can it list all possible test, inspection, and corrective action steps that may be taken. If a malfunction occurs for which no symptom is listed, or if the listed corrective actions do not resolve the trouble, notify your supervisor.

d. Troubles or corrective actions beyond the scope of operator capabilities must be reported to organizational maintenance.

Table 3-1. OPERATOR TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

Step 1. Check that input power has not been disconnected.

Connect input power.

CAUTION

During cool weather do not start in COOL mode for four hours. Damage to the equipment may result if personnel fail to observe precautions.

Step 2. Check if CONTROL CIRCUIT BREAKER or COMPR CIRCUIT BKR has tripped.

Reset circuit breaker(s).

2. REDUCED COOLING CAPACITY.

Step 1. Check that MODE SELECTOR switch is turned to COOL.

Turn switch to COOL.

Table 3-1. OPERATOR TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 2. Check operation of TEMPERATURE SELECTOR.

Set control at maximum COOLER, then, if condition improves, adjust properly.

Step 3. Check that supply and return air louvers are properly adjusted.

Adjust louvers properly.

Step 4. Check that excessive hot, outside air is not being introduced through fresh air damper.

Fully close damper, then, if condition improves, adjust properly.

Step 5. Check that all doors, windows, and other openings in room or enclosure are tightly closed.

Tightly close all openings.

Step 6. Check that condenser air inlet guard or discharge air louver are not obstructed.

Remove obstruction.

Step 7. Check condition of refrigerant in sight glass.

If refrigerant color is in the yellow zone or numerous bubbles appear in window, turn selector to OFF and contact direct support maintenance.

3. REDUCED HEATING CAPACITY.

Step 1. See that MODE SELECTOR switch is properly set.

Set switch on LOW or HIGH HEAT.

Step 2. Check operation of TEMPERATURE SELECTOR switch.

Set control to fully WARMER then, if condition improves, adjust properly.

Table 3-1. OPERATOR TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 3. Check that supply and return air louvers are properly adjusted.

Adjust louvers to open position.

Step 4. Check that excessive cold, outside air is not being introduced through fresh air damper.

Fully close damper, then, if condition improves, adjust properly.

Step 5. Check that all doors, windows, and other openings in room or enclosure are tightly closed.

Tightly close all openings.

4. TOO MUCH HEAT.

Step 1. See that MODE SELECTOR switch is properly set.

Set switch on LOW HEAT. (When MODE SELECTOR switch is set for HIGH HEAT, half of the heaters will operate all of the time.)

Step 2. Check operation of TEMPERATURE SELECTOR switch.

Adjust to a slightly COOLER setting.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

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Preparation for Storage........ 4-43

Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

4-1. GENERAL.

a. Repair parts are listed and illustrated in TM5-4120-384-24P. No special tools are required for maintenance of the equipment. Test, maintenance, and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment found in any organizational maintenance electric shop.

b. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

c. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-596-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	National Stock Number
Brush, Bristle	7520-00-223-8000
Brush, Wire	7920-00-282-9246
Bucket	7240-00-137-1609
Heat Gun	4940-01-042-4855

4-1. GENERAL.-Continued

Multimeter	6625-00-553-0142
Pliers, Long Round Nose	5120-00-268-3579
Rubber Gloves	8415-00-266-8677
Safety Goggles	4240-00-052-3776
Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293
Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014

Section II SERVICE UPON RECEIPT OF EQUIPMENT

4-2. SITE AND SHELTER REQUIREMENTS.

The air conditioner is designed so that it is adaptable to a variety of installation arrangements. Most typical installations are made by preparing an opening in an exterior wall of the room or enclosure to be conditioned and positioning the air conditioner so that the front of the cabinet is inside the room or enclosure and the back of the cabinet is outside. Alternate installations may be made with the entire cabinet either inside or outside the conditioned area. The following are minimum requirements for all installations:

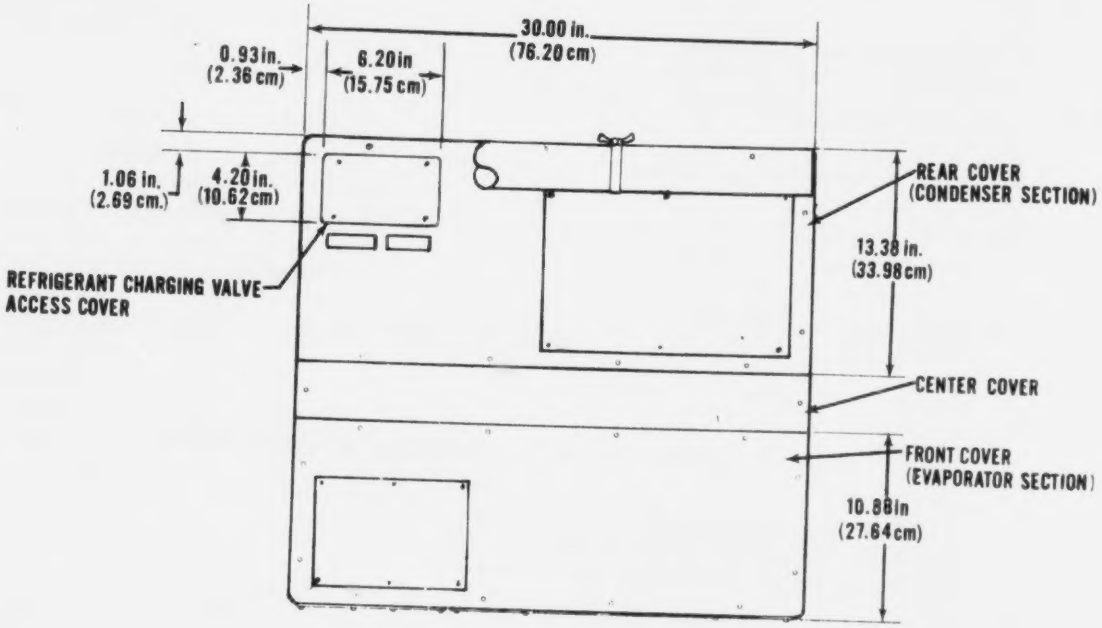
a. A relatively level surface capable of bearing the weight of the air conditioner on which to set the base. To insure proper condensate drainage, the surface should be level within 5° from front to back and side to side. See fig. 4-1, Sheets 1, 2 and 3 for mounting dimensions.

b. An unobstructed flow of air from outside the conditioned area to the intake and discharge of the condenser fan (back face of air conditioner).

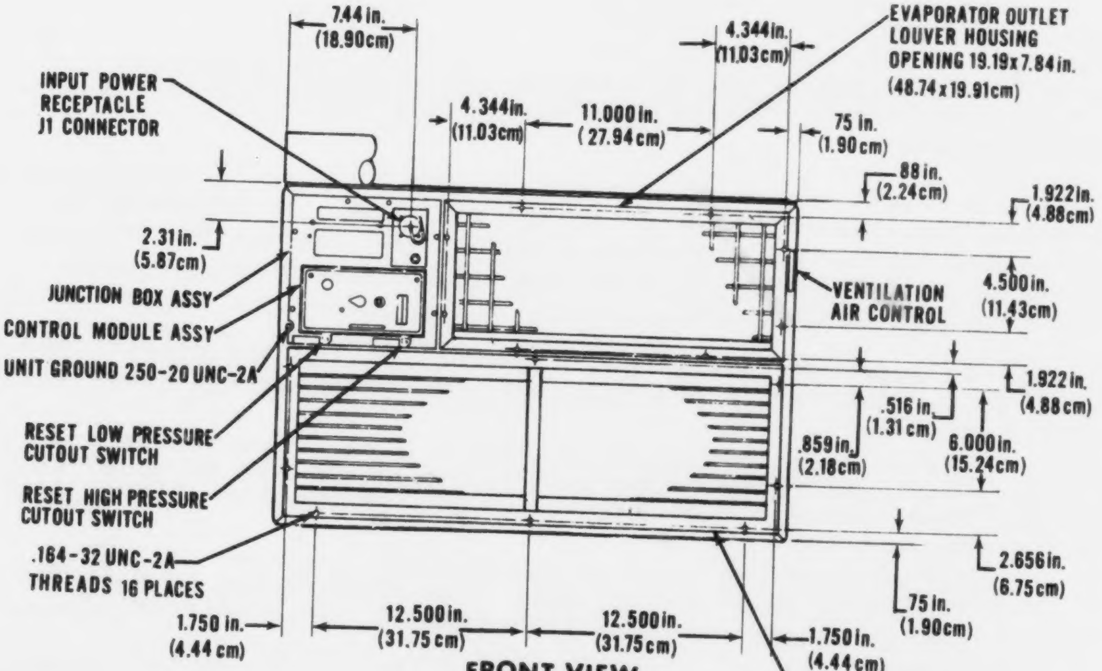
c. An unobstructed flow of air from inside the conditioned area to the conditioned air supply and discharge openings (front face of air conditioner).

d. An unobstructed flow of air from outside the conditioned area to the fresh air intake (back face of air conditioner).

e. Access to the front and back of the air conditioner for routine operation and servicing and for necessary maintenance actions.


30.00 in.
(76.20 cm)
0.93 in.
(2.36 cm)
6.20 in
(15.75 cm)
1.06 in.
(2.69 cm.)
4.20 in.
(10.62 cm)
REFRIGERANT CHARGING VALVE ACCESS COVER
REAR COVER (CONDENSER SECTION)
13.38 in.
(33.98 cm)
CENTER COVER
FRONT COVER (EVAPORATOR SECTION)
10.88 in
(27.64 cm)

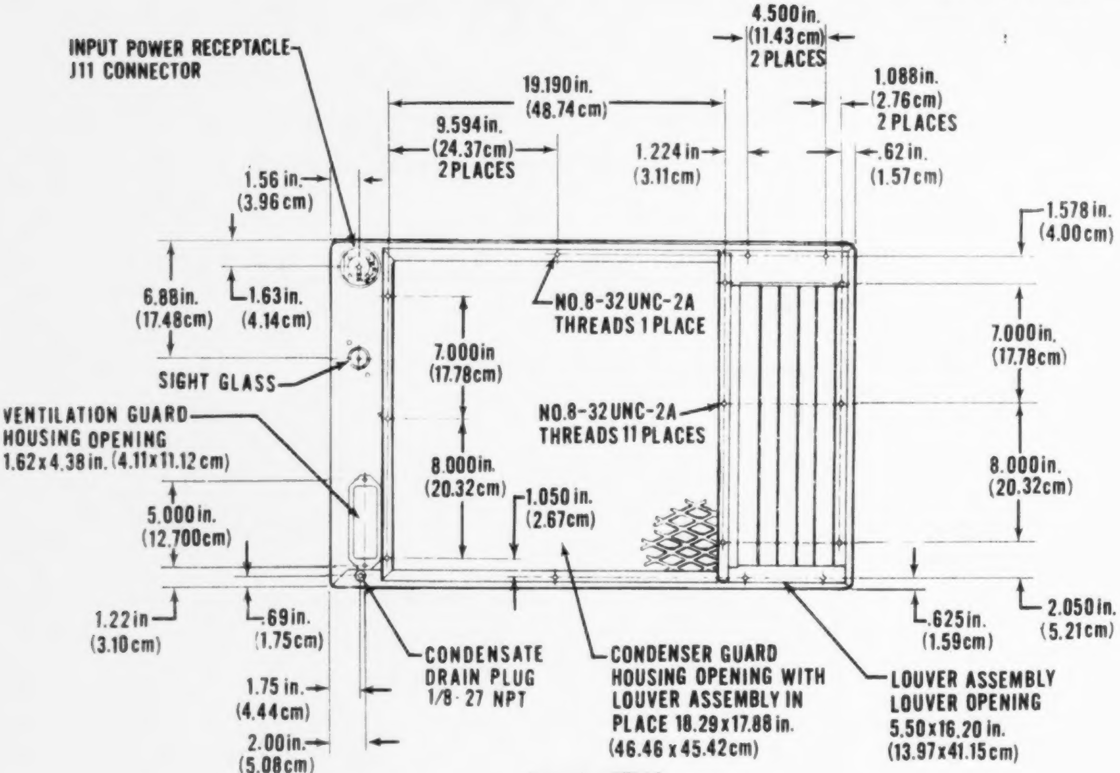
TOP VIEW


7.44 in.
(18.90 cm)
4.344 in.
(11.03 cm)
EVAPORATOR OUTLET LOUVER HOUSING OPENING 19.19 x 7.84 in.
(48.74 x 19.91 cm)
INPUT POWER RECEPTACLE J1 CONNECTOR
4.344 in.
(11.03 cm)
11.000 in.
(27.94 cm)
.75 in.
(1.90 cm)
.88 in.
(2.24 cm)
1.922 in.
(4.88 cm)
2.31 in.
(5.87 cm)
JUNCTION BOX ASSY
CONTROL MODULE ASSY
UNIT GROUND 250-20 UNC-2A
VENTILATION AIR CONTROL
4.500 in.
(11.43 cm)
1.922 in.
(4.88 cm)
.516 in.
(1.31 cm)
.859 in.
(2.18 cm)
6.000 in.
(15.24 cm)
RESET LOW PRESSURE CUTOUT SWITCH
RESET HIGH PRESSURE CUTOUT SWITCH
.164-32 UNC-2A THREADS 16 PLACES
2.656 in.
(6.75 cm)
.75 in.
(1.90 cm)
1.750 in.
(4.44 cm)
12.500 in.
(31.75 cm)
12.500 in.
(31.75 cm)
1.750 in.
(4.44 cm)
EVAPORATOR INLET LOUVER AND FILTER HOUSING OPENING 28.00 x 9.01 in. (71.12 x 22.88 cm)

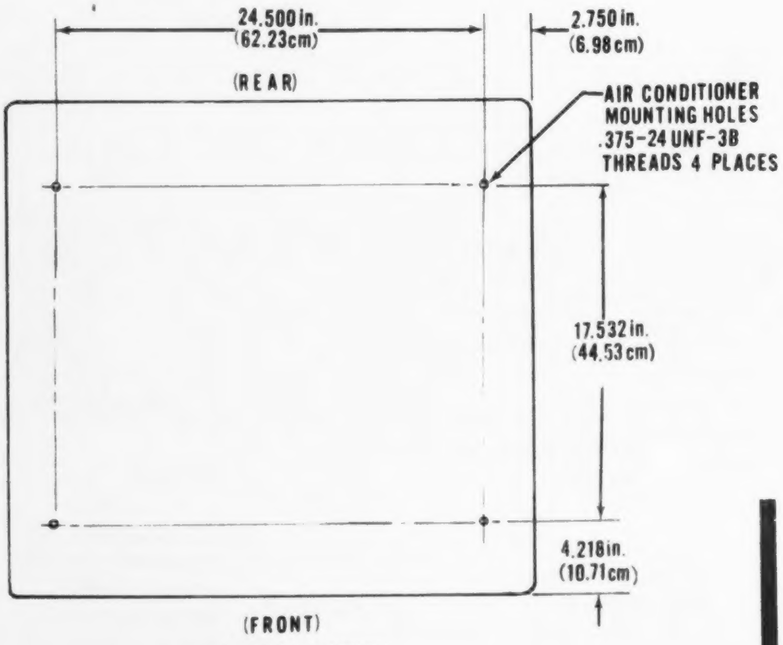
FRONT VIEW

NOTE: THIS SHEET APPLIES TO MODELS F18H-3S AND F18H-1S ONLY. SEE SHEETS 4 THRU 6 FOR MODELS F18H-3SA AND F18H-3SB.

Figure 4-1. Installation Dimensions (Sheet 1 of 6)


INPUT POWER RECEPTACLE
J11 CONNECTOR
4.500 in.
(11.43 cm)
2 PLACES
19.190 in.
(48.74 cm)
1.088 in.
(2.76 cm)
2 PLACES
9.594 in.
(24.37 cm)
2 PLACES
1.224 in
(3.11 cm)
.62 in.
(1.57 cm)
1.56 in.
(3.96 cm)
1.578 in.
(4.00 cm)
6.88 in.
(17.48 cm)
1.63 in.
(4.14 cm)
NO.8-32 UNC-2A
THREADS 1 PLACE
7.000 in
(17.78 cm)
7.000 in.
(17.78 cm)
SIGHT GLASS
VENTILATION GUARD
HOUSING OPENING
1.62 x 4.38 in. (4.11 x 11.12 cm)
NO.8-32 UNC-2A
THREADS 11 PLACES
8.000 in.
(20.32 cm)
8.000 in.
(20.32 cm)
1.050 in.
(2.67 cm)
5.000 in.
(12.700 cm)
1.22 in
(3.10 cm)
.69 in.
(1.75 cm)
.625 in.
(1.59 cm)
2.050 in.
(5.21 cm)
CONDENSATE
DRAIN PLUG
1/8-27 NPT
CONDENSER GUARD
HOUSING OPENING WITH
LOUVER ASSEMBLY IN
PLACE 18.29 x 17.88 in.
(46.46 x 45.42 cm)
LOUVER ASSEMBLY
LOUVER OPENING
5.50 x 16.20 in.
(13.97 x 41.15 cm)
1.75 in.
(4.44 cm)
2.00 in.
(5.08 cm)

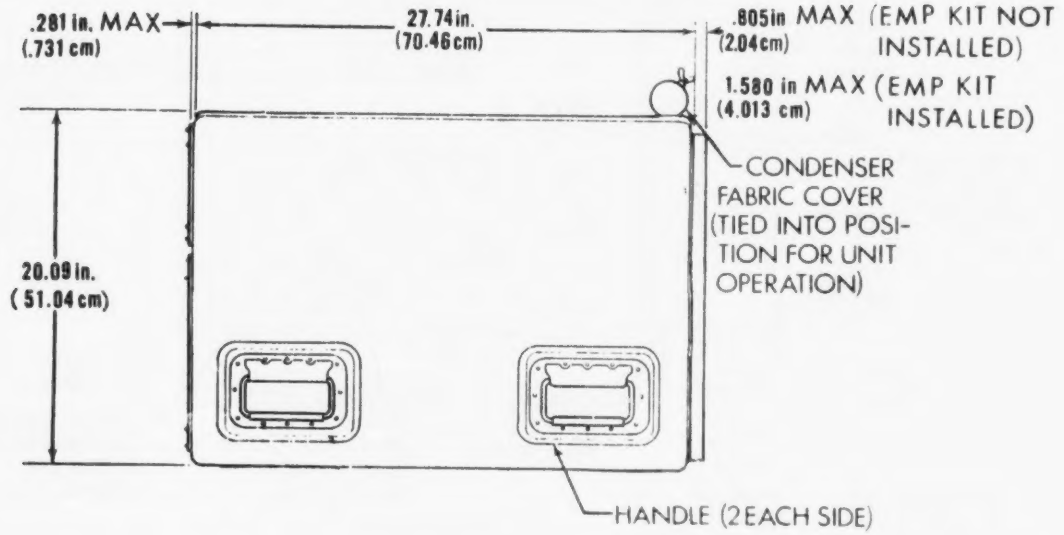
REAR VIEW


24.500 in.
(62.23 cm)
2.750 in.
(6.98 cm)
(REAR)
AIR CONDITIONER
MOUNTING HOLES
.375-24 UNF-3B
THREADS 4 PLACES
17.532 in.
(44.53 cm)
4.218 in.
(10.71 cm)
(FRONT)

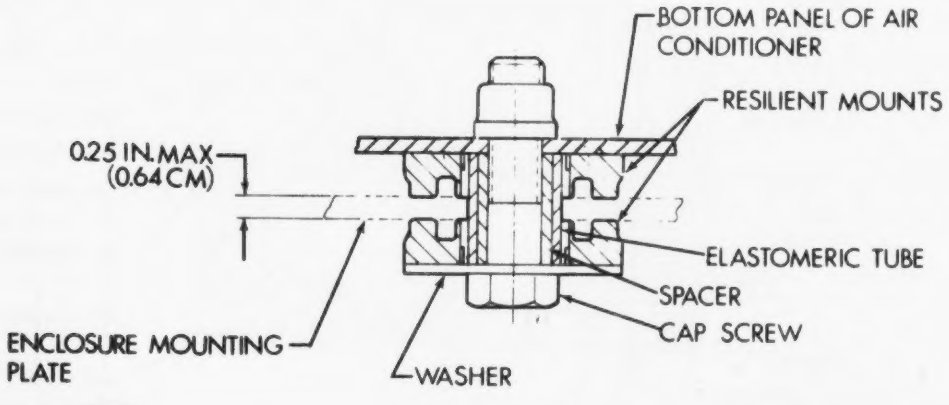
NOTE:
THIS SHEET APPLIES TO MODELS F18H-3S AND F18H-1S ONLY
SEE SHEETS 4 THRU 6 FOR MODELS F18H-3SA AND F18H-3SB.

BOTTOM VIEW

Figure 4-1. Installation Dimensions (Sheet 2 of 6)


.281 in. MAX
(.731 cm)
27.74 in.
(70.46 cm)
.805 in MAX (EMP KIT NOT INSTALLED)
(2.04 cm)
1.580 in MAX (EMP KIT INSTALLED)
(4.013 cm)
CONDENSER FABRIC COVER (TIED INTO POSITION FOR UNIT OPERATION)
20.09 in.
(51.04 cm)
HANDLE (2 EACH SIDE)

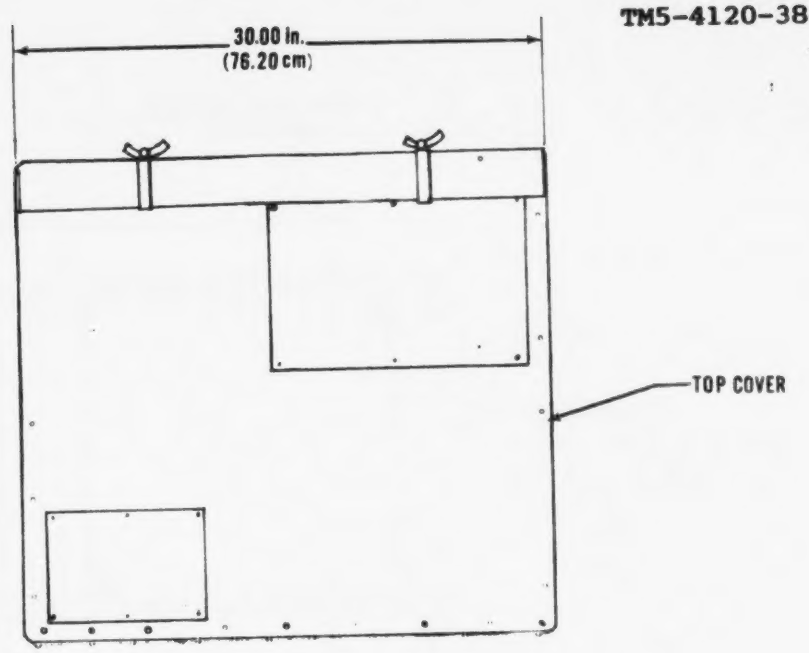
RIGHT SIDE VIEW


BOTTOM PANEL OF AIR CONDITIONER
RESILIENT MOUNTS
0.25 IN. MAX
(0.64 CM)
ELASTOMERIC TUBE
SPACER
CAP SCREW
ENCLOSURE MOUNTING PLATE
WASHER

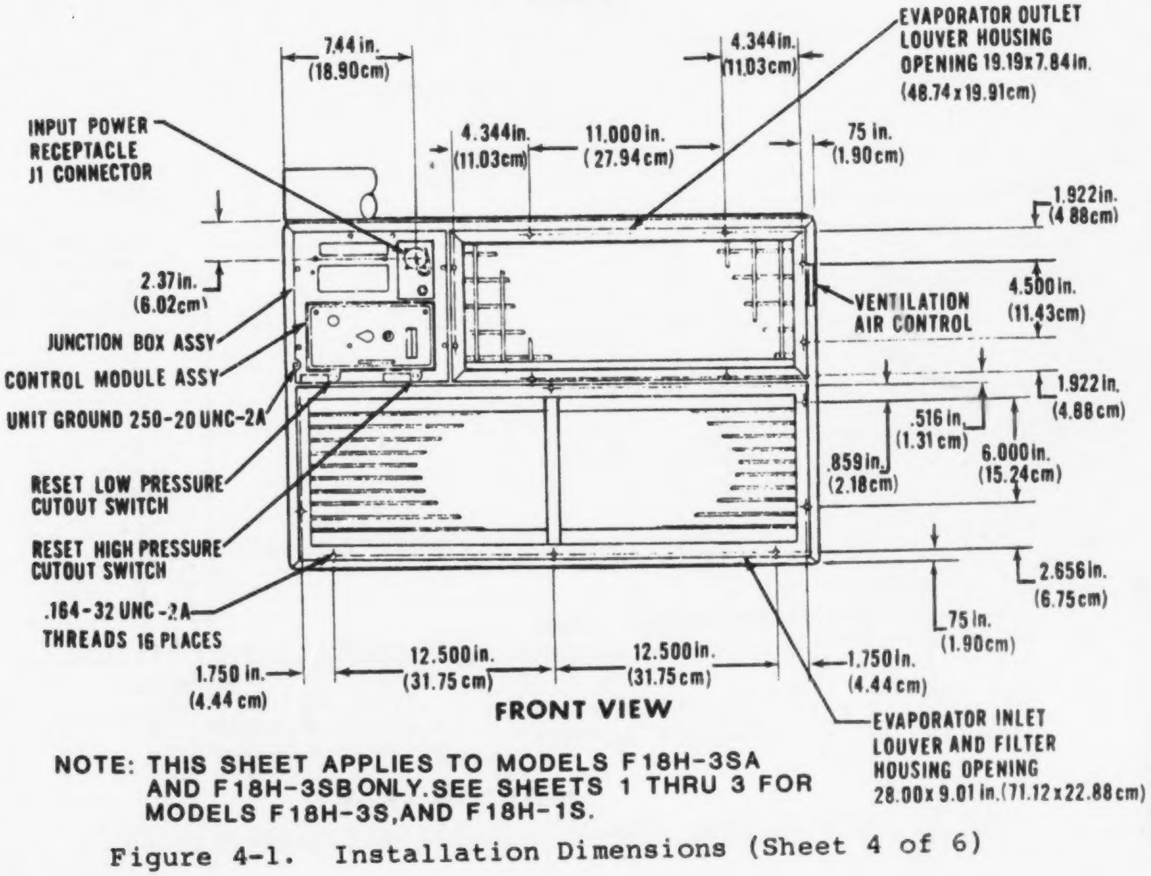
CROSS SECTION OF BOTTOM MOUNTING HOLE AND HARDWARE (TYPICAL 4 PLACES)

NOTE:
THIS SHEET APPLIES TO MODELS F18H-3S AND F18H-1S ONLY.
SEE SHEETS 4 THRU 6 FOR MODELS F18H-3SA AND F18H-3SB.

Figure 4-1. Installation Dimensions (Sheet 3 of 6)


30.00 in.
(76.20 cm)
TOP COVER

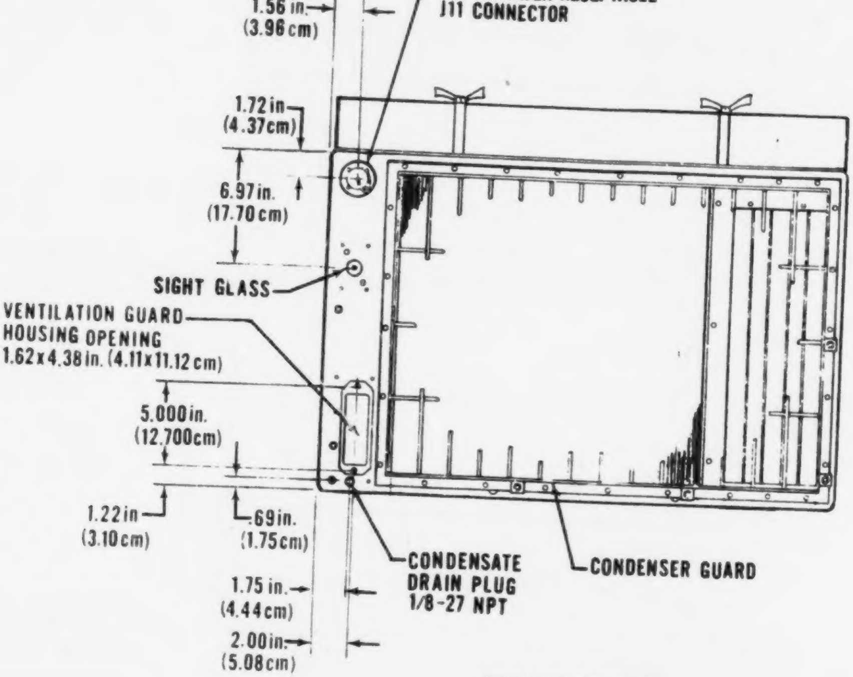
TOP VIEW


7.44 in.
(18.90cm)
4.344in.
(11.03cm)
EVAPORATOR OUTLET
LOUVER HOUSING
OPENING 19.19x7.84in.
(48.74x19.91cm)
INPUT POWER
RECEPTACLE
J1 CONNECTOR
4.344in.
(11.03cm)
11.000in.
(27.94cm)
75 in.
(1.90cm)
1.922in.
(4.88cm)
2.37in.
(6.02cm)
4.500in.
(11.43cm)
VENTILATION
AIR CONTROL
JUNCTION BOX ASSY
CONTROL MODULE ASSY
UNIT GROUND 250-20 UNC-2A
1.922in.
(4.88cm)
.516 in.
(1.31 cm)
6.000in.
(15.24cm)
.859in.
(2.18cm)
RESET LOW PRESSURE
CUTOUT SWITCH
RESET HIGH PRESSURE
CUTOUT SWITCH
2.656in.
(6.75cm)
.164-32 UNC-2A
THREADS 16 PLACES
75 in.
(1.90cm)
1.750 in.
(4.44 cm)
12.500in.
(31.75 cm)
12.500in.
(31.75cm)
1.750in.
(4.44 cm)
EVAPORATOR INLET
LOUVER AND FILTER
HOUSING OPENING
28.00x9.01 in.(71.12x22.88cm)

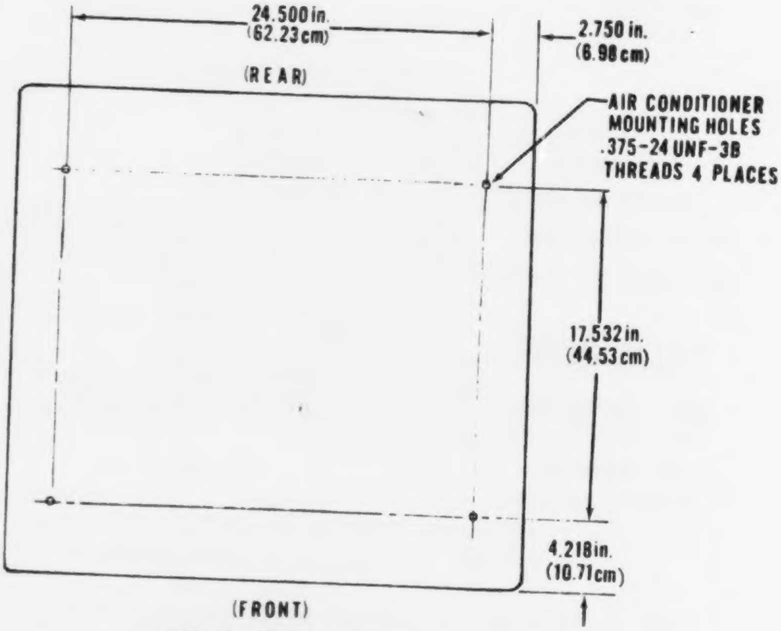
FRONT VIEW

NOTE: THIS SHEET APPLIES TO MODELS F18H-3SA AND F18H-3SB ONLY. SEE SHEETS 1 THRU 3 FOR MODELS F18H-3S, AND F18H-1S.

Figure 4-1. Installation Dimensions (Sheet 4 of 6)


1.56 in.
(3.96 cm)
INPUT POWER RECEPTACLE
J11 CONNECTOR
1.72 in
(4.37 cm)
6.97 in.
(17.70 cm)
SIGHT GLASS
VENTILATION GUARD
HOUSING OPENING
1.62 x 4.38 in. (4.11 x 11.12 cm)
5.000 in.
(12.700 cm)
1.22 in
(3.10 cm)
.69 in.
(1.75 cm)
CONDENSATE
DRAIN PLUG
1/8-27 NPT
CONDENSER GUARD
1.75 in.
(4.44 cm)
2.00 in.
(5.08 cm)

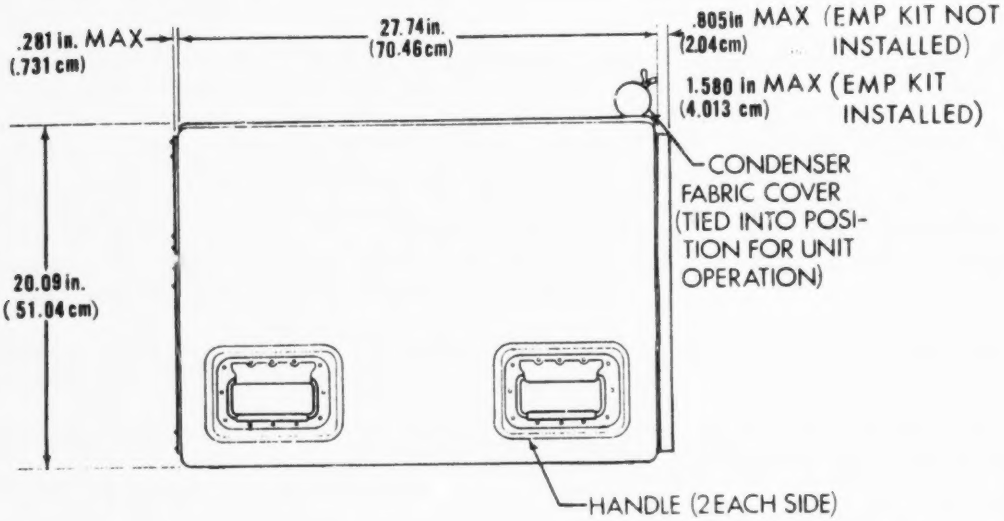
REAR VIEW


24.500 in.
(62.23 cm)
2.750 in.
(6.98 cm)
(REAR)
AIR CONDITIONER
MOUNTING HOLES
.375-24 UNF-3B
THREADS 4 PLACES
17.532 in.
(44.53 cm)
4.218 in.
(10.71 cm)
(FRONT)

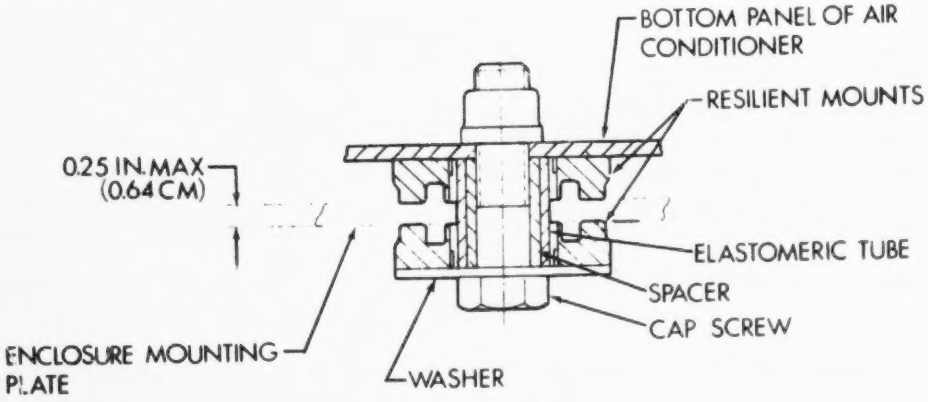
NOTE:
THIS SHEET APPLIES TO MODELS F18H-3SA AND F18-3SB ONLY. SEE SHEETS 1 THRU 3 FOR MODELS F18H-3S AND F18-1S.

BOTTOM VIEW

Figure 4-1. Installation Dimensions (Sheet 5 of 6)


.281 in. MAX
(.731 cm)
27.74 in.
(70.46 cm)
.805 in MAX (EMP KIT NOT INSTALLED)
(2.04 cm)
1.580 in MAX (EMP KIT INSTALLED)
(4.013 cm)
CONDENSER FABRIC COVER (TIED INTO POSITION FOR UNIT OPERATION)
20.09 in.
(51.04 cm)
HANDLE (2 EACH SIDE)

RIGHT SIDE VIEW


BOTTOM PANEL OF AIR CONDITIONER
RESILIENT MOUNTS
0.25 IN. MAX
(0.64 CM)
ELASTOMERIC TUBE
SPACER
CAP SCREW
ENCLOSURE MOUNTING PLATE
WASHER

CROSS SECTION OF BOTTOM MOUNTING HOLE AND HARDWARE (TYPICAL 4 PLACES)

NOTE: THIS SHEET APPLIES TO MODELS F18H-3SA AND F18-3SB ONLY. SEE SHEETS 1 THRU 3 FOR MODELS F18H-3S AND F18H-1S.

Figure 4-1. Installation Dimensions (Sheet 6 of 6)

4-2. SITE AND SHELTER REQUIREMENTS.-Continued

f. Access to and sufficient headroom to allow removal of the front and rear top panels is necessary, if the unit is to be serviced when installed.

g. Use a source of 208 volt, 3 phase, 50/60 hertz input power rated at 16 amps for the F18H-3S, F18H-3SA and F18H-3SB units or 230 volt, single phase, 60 hertz power rated at 25 amps for the F18H-1S unit. The power source outlet should be located as near as possible to the installed location of the air conditioner. The power source wiring must include a disconnect switch. However, provisions should be made to insure that power is not disconnected during normal operation and that the disconnect is not used to turn off the air conditioner for normal shutdown.

h. Check that no source of dangerous or objectionable fumes are near the fresh air intake.

i. If possible make use of terrain features such as trees and buildings to provide a shaded location. This minimizes the cooling load on the refrigeration system.

j. If possible avoid a location where the condenser and fresh air intakes will be laden with dust, dirt, soot, smoke or other debris.

4-3. SERVICE UPON RECEIPT OF MATERIAL.

a. Unloading. The air conditioner is packaged in a container designed for shipment and handling with the cabinet in an upright position. The base of the container is constructed as a shipping pallet with provisions for the insertion of the tongs of a fork on materials handling equipment.

(1) Remove all blocking and tiedowns that may have been used to secure the container to the carrier.

(2) Use a forklift truck or other suitable material handling equipment to remove the packaged unit from the carrier.

CAUTION

Use care in handling to avoid damage to the air conditioner. If an overhead lifting device must be used, use an appropriate sling so that the weight of the unit is borne by the base of the shipping container. Failure to heed this caution can result in damage to equipment.

4-3. SERVICE UPON RECEIPT OF MATERIAL.-Continued

b. Unpacking.

(1) General. Normally, the packaged air conditioner should be moved into the immediate area in which it is to be installed before it is unpacked.

NOTE

The shipping container is of such a design that it may be retained for reuse for mobility purposes if frequent relocation of the air conditioner is anticipated.

(2) Remove Shipping Container. Cut the metal bands that hold the top and sides of the container to the base. Lift the container vertically and remove it from the base and cabinet.

(3) Remove Packaging. Remove the cushioning around the top of the cabinet and retain, if reuse is anticipated. Remove the preservation barrier by tearing around the bottom of the cabinet. Remove the technical publications envelope and accessory sack that are taped to the cabinet and put them in a safe place.

NOTE

It is recommended that the cabinet be left bolted to the shipping pallet until time to place it in the installation position. All receiving inspection actions can be conducted without removal from the pallet.

c. Receiving Inspection. Perform receiving inspection of the air conditioner in the following manner:

(1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report damage on DD Form 6, Packaging Improvement Report.

(2) Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pamphlet 738-750 (The Army Maintenance Management System).

(3) Check to see whether the equipment has been modified.

4-3. SERVICE UPON RECEIPT OF MATERIAL.-Continued

NOTE

The unit weight (less shipping pallet) is 265 pounds (120.0 kg) for F18H-3S, F18H-3SA and F18H-3SB. Weight is 275 pounds (124.7 kg) for F18H-1S. When lifting or moving the unit on the shipping pallet, a forklift may be used. When lifting the unit into the installation position a lifting hoist should be used.

(4) Remove Pallet. Tilt the unit and pallet or raise the unit using a forklift. Remove the four bolts from the bottom of the pallet. Carefully lift the unit from the shipping pallet.

4-4. INSTALLATION INSTRUCTIONS.

a. Air Conditioner Preparation For Installation.

(1) Two input power connectors are provided on the air conditioner. (See fig. 4-1.) Connector J1 is located on the front of the air conditioner above the control panel module. Connector J11 is located on the rear of the air conditioner in the upper left corner. Determine which connector best suits your installation. If power source is inside of conditioned area use J1. If power source is outside of conditioned area use J11.

(a) Air conditioners are shipped from the factory wired for the use of the J1 power connector. If this connector is used no change is necessary. (See fig. 4-2.)

(b) If the J11 connector is to be used, proceed as follows:

1 Remove top(front) cover from air conditioner (para 4-11).

2 Disconnect wire TB1.1-TB3.1 from TB3 terminal 1 and reconnect to terminal 4.

3 Disconnect wire TB1.2-TB3.2 from TB3 terminal 2 and reconnect to terminal 5.

4 (Not applicable to model F18H-1S.) Disconnect wire TB1.3-TB3.3 from TB3 terminal 3 and reconnect to terminal 6.

5 Install top (front) cover (para 4-11).

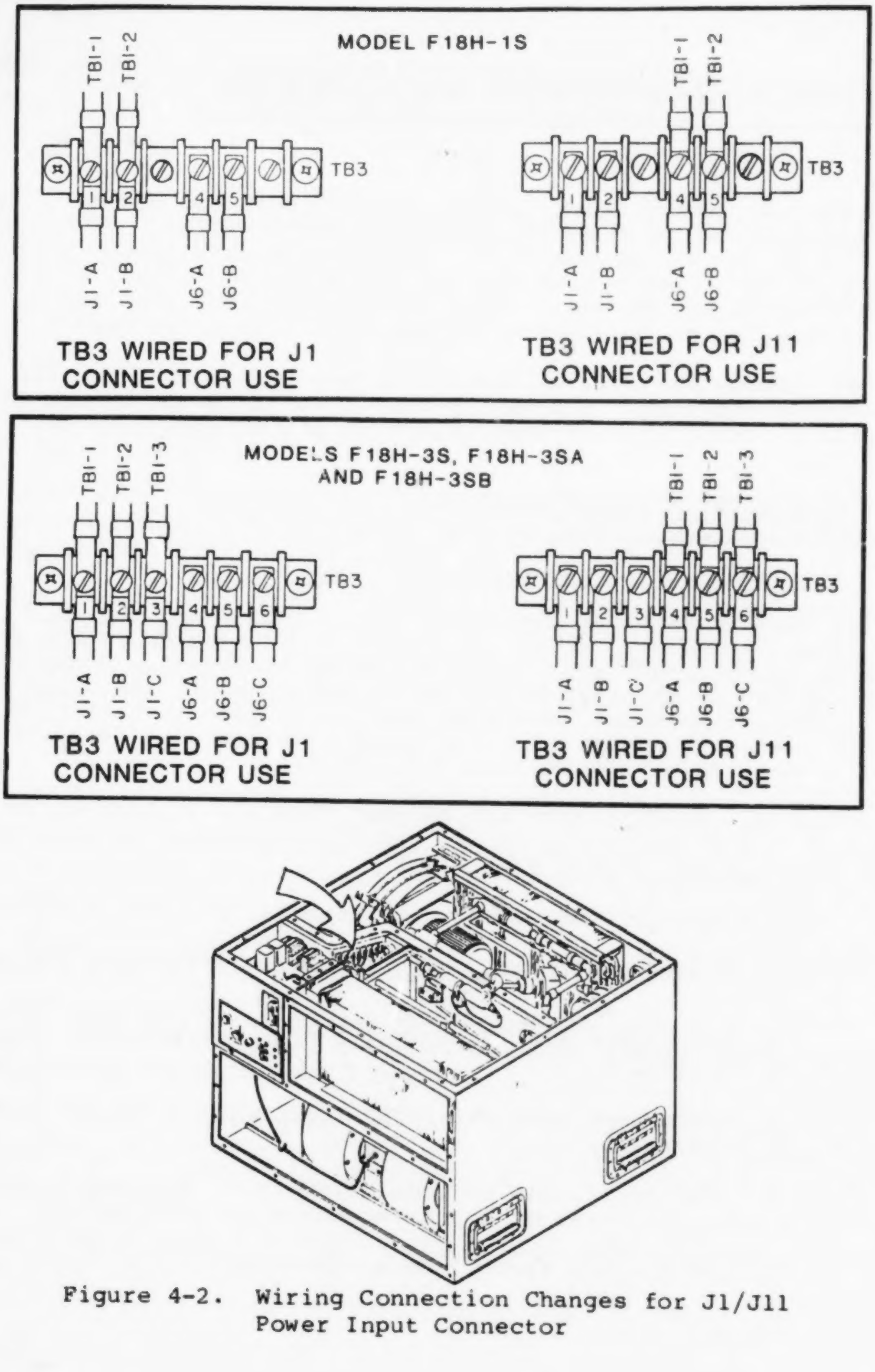

MODEL F18H-1S
TBI-1
TBI-2
TB3
1
2
4
5
J1-A
J1-B
J6-A
J6-B
TB3 WIRED FOR J1 CONNECTOR USE
TB3 WIRED FOR J11 CONNECTOR USE
MODELS F18H-3S, F18H-3SA AND F18H-3SB
TBI-3
3
6
J1-C
J6-C

Figure 4-2. Wiring Connection Changes for J1/J11 Power Input Connector

4-4. INSTALLATION INSTRUCTIONS.-Continued

(2) Connectors are provided to permit remote installation of the control module. If it is determined that it is desirable to mount the control module in a remote (mounted elsewhere in the conditioned space) location the following steps must be taken. (See fig. 4-3.)

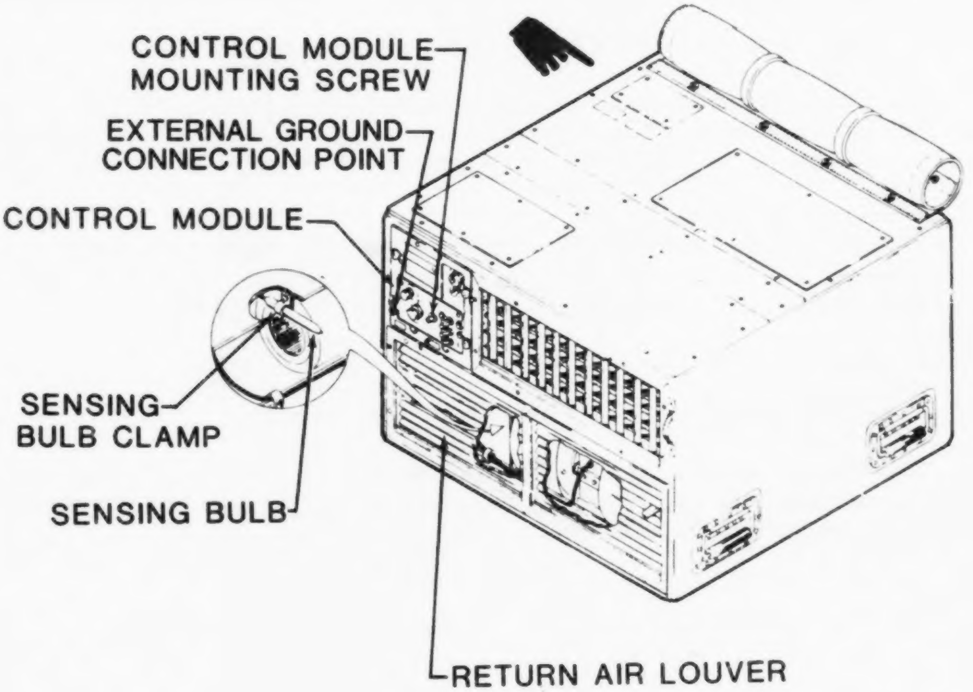

CONTROL MODULE MOUNTING SCREW
EXTERNAL GROUND CONNECTION POINT
CONTROL MODULE
SENSING BULB CLAMP
SENSING BULB
RETURN AIR LOUVER

Figure 4-3 Control Module Removal

(a) Remove return air louver (para 4-13).

(b) Loosen sensing bulb clamp screw and slip sensing bulb out of clamp.

4-4. INSTALLATION INSTRUCTIONS.-Continued

(c) Loosen control module mounting screw and carefully pull control module out of unit. Use care to avoid damage to sensing line.

(d) Carefully work sensing bulb through frame and out of the unit.

(e) Determine where control module is to be located. Note that the sensing bulb controls the thermostatic action of the TEMPERATURE SELECTOR. It should be mounted where a true room or enclosure temperature will be indicated. Do not place near heat or cool producing items. A false temperature control would result.

(f) Secure control module and sensing bulb.

(g) The receptacle and plug needed to fabricate the interconnecting cable are provided with unit. Determine length of wire needed to connect plug and receptacle between unit and control module.

(h) See interconnecting remote control cable wiring diagram, figure 4-4 sheet 4 and fabricate the interconnecting cable. This cable will connect between P2A/B and J2A/B.

(i) Connect cable.

(j) Install return air louver (para 4-13).

(3) No other preparation is necessary if the air conditioner is to be installed by the typical exterior wall opening method and operated as a self-contained unit.

COMPONENT REFERENCE LIST		
ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	13211E3793	COMPRESSOR
B2	13221E9334	MOTOR, CONDENSER FAN
B3	13221E9311	MOTOR, EVAPORATOR FAN
C1	M39014/05-2661	CAPACITOR, FILTER (MIL-C-39014/5)
C2	13218E6961	CAPACITOR
CB1	13216E6205	CIRCUIT BREAKER, COMPRESSOR
CB2	13216E6178	CIRCUIT BREAKER, CONTROL
CR1	13216E6223	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S50	TERMINAL STUD (CONTROL MODULE GND)
E2	MS24693-S50	TERMINAL STUD (JUNCTION BOX GND)
E3 AND E4	MS35206-245	TERMINAL STUD (SYSTEM GND)
HR1 THRU 6	13216E6124-4	HEATER ELEMENT
J1 AND 11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	13216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	13216E6193-2	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	13216E6193-3	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	13215E6193-2	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	13216E5193-5	CONNECTOR, RECEPTACLE, POWER INPUT
J8	13215E6193-1	CONNECTOR, RECEPTACLE, SOLENOID
		VALVE BY-PASS
J9	13216E6193-1	CONNECTOR, RECEPTACLE SOLENOID
		VALVE EQUALIZER
J1C	PART OF B1	CONNECTOR, RECEPTACLE, COMPRESSOR
K1	13225E8024-1	RELAY, TIME DELAY
K2	MS24192D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	13216E6184	RELAY, CONDENSER FAN
K5	13216E6184	RELAY, EVAPORATOR FAN
L1	13216E6158	VALVE, SOLENOID, BY-PASS
L2	13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	13216E6209-2	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF B3	CONNECTOR, PLUG, EVAPORATOR FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF B2	CONNECTOR, PLUG, CONDENSER FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P8	13215E6173	CONNECTOR, PLUG, SOLENOID
		VALVE BY-PASS
P9	13216E6173	CONNECTOR, PLUG, SOLENOID
		VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	13216E6201	SWITCH, ROTARY SELECTOR
S3	13216E6203	SWITCH, TEMPERATURE CONTROL
S4	13216E6215-3	SWITCH, HIGH PRESSURE CUTOUT
S5	13216E6215-1	SWITCH, LOW PRESSURE CUTOUT
S6	13216E6224	SWITCH, HEATER CUTOUT
T1	13221E9117	TRANSFORMER
TB1	13216E6231	TERMINAL BOARD, JUNCTION BOX
TB2	13216E6220-1	TERMINAL BOARD
TB3	13216E6232	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11), THE LEADS ORIGINATING FROM TB1-1, TB1-2 AND TB1-3 ON TB3-1, -2 AND -3 MUST BE CHANCED TO TB3-4, -5 AND -6 RESPECTIVELY.

Figure 4-4. Wiring Diagram (Sheet 1 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

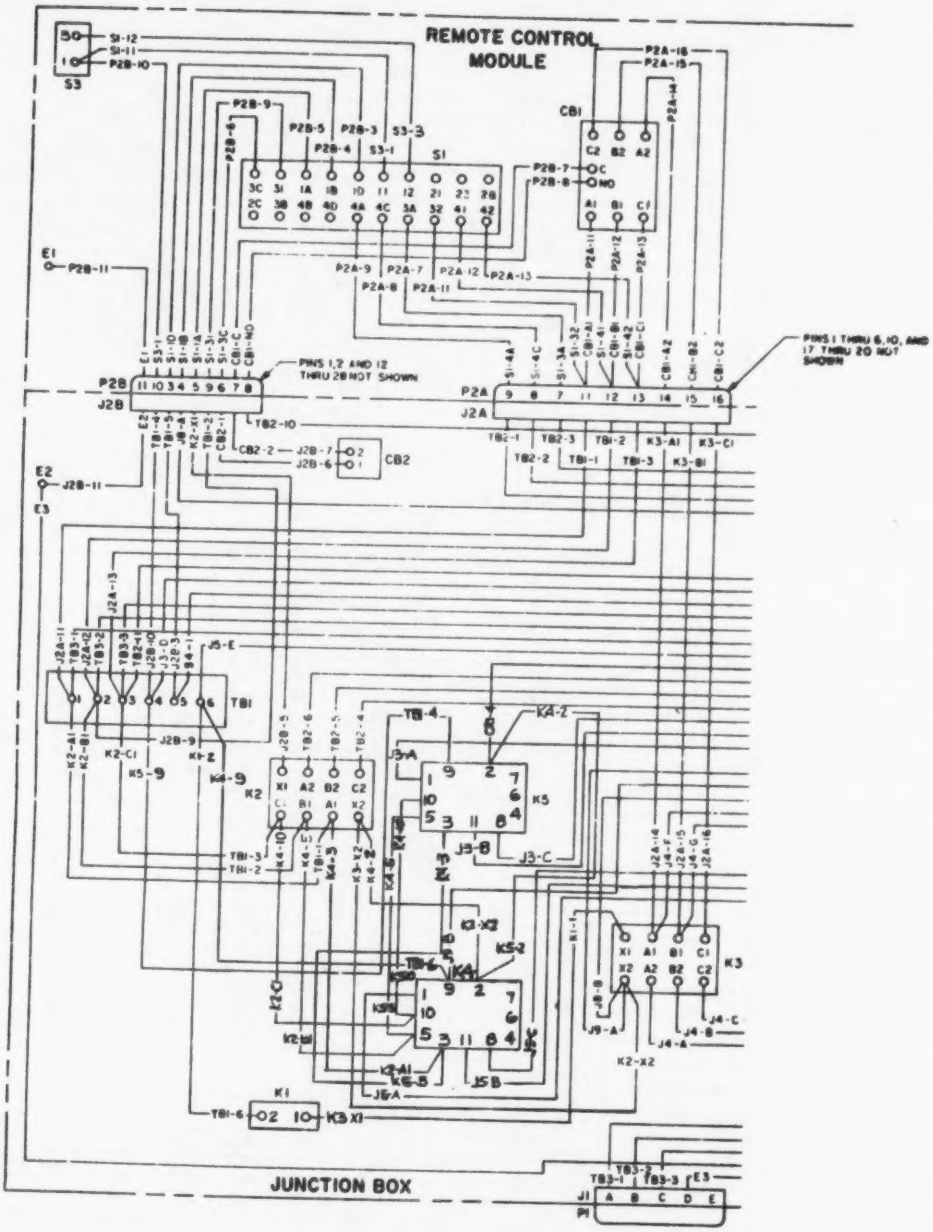

REMOTE CONTROL MODULE
S3
S1
CB1
P2B
J2B
PINS 1,2 AND 12 THRU 28 NOT SHOWN
P2A
J2A
PINS 1 THRU 6, 10, AND 17 THRU 20 NOT SHOWN
CB2
E1
E2
E3
TB1
K2
K5
K4
K3
K1
JUNCTION BOX
J1
P1
A
B
C
D
E

Figure 4-4. Wiring Diagram (Sheet 2 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

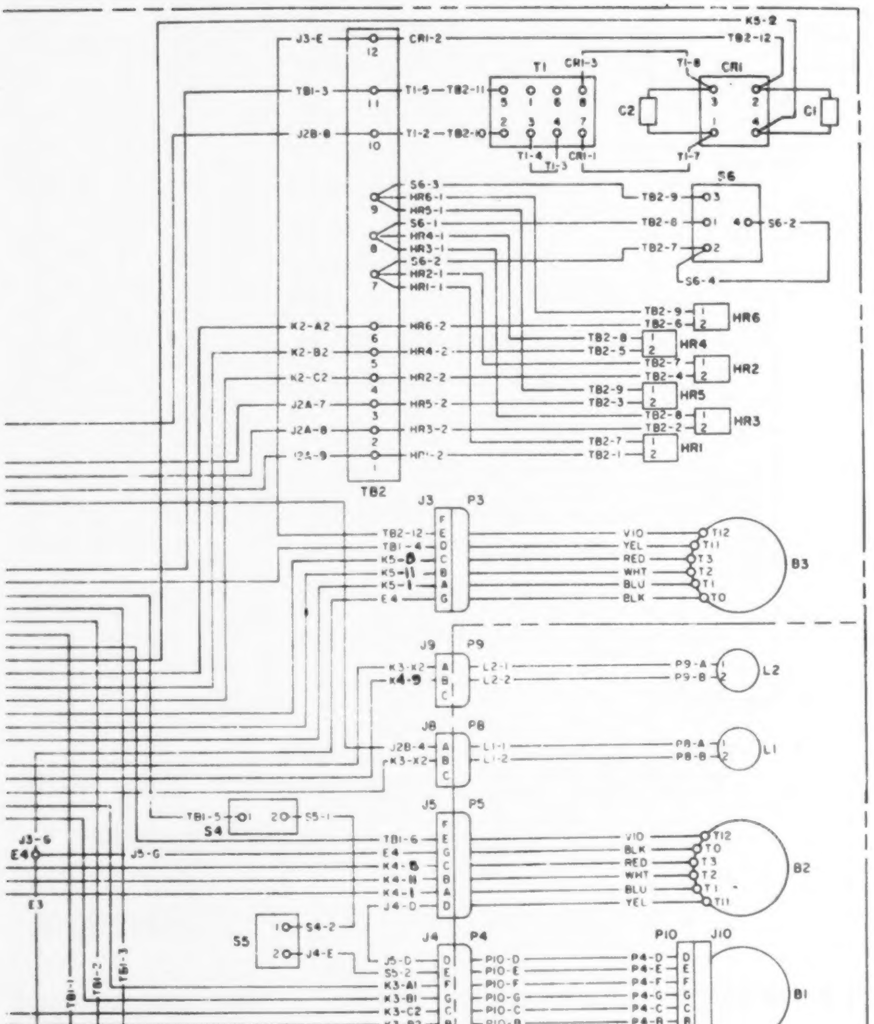
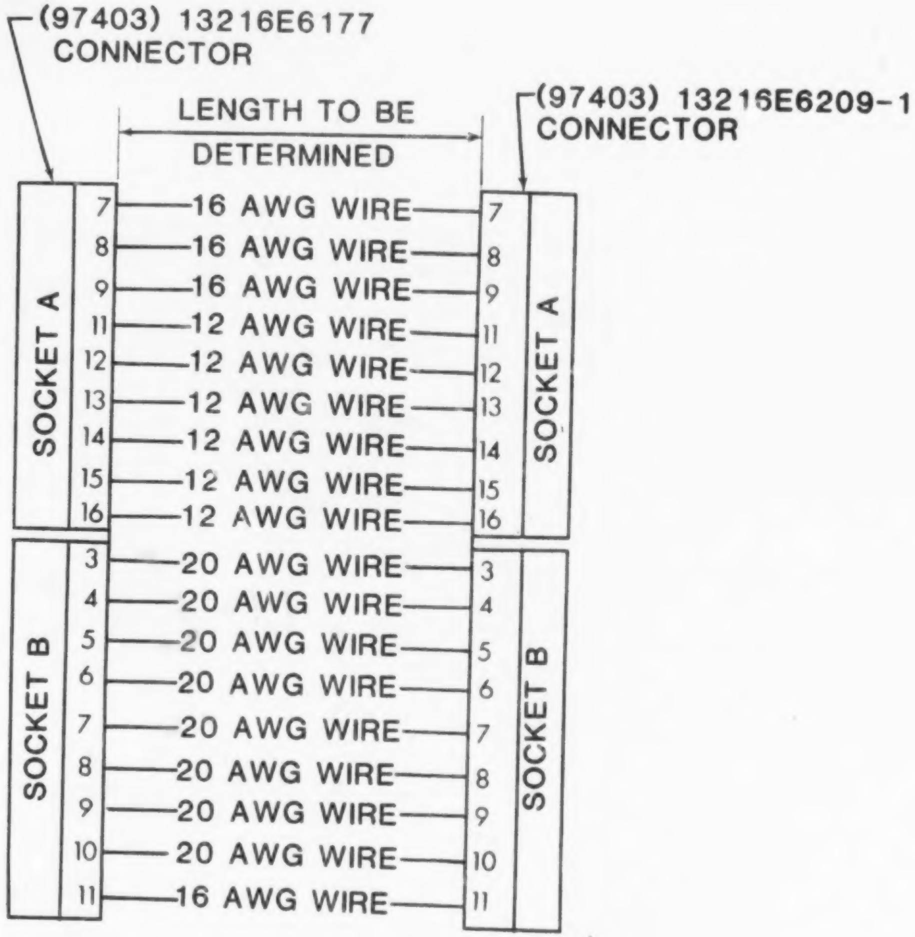
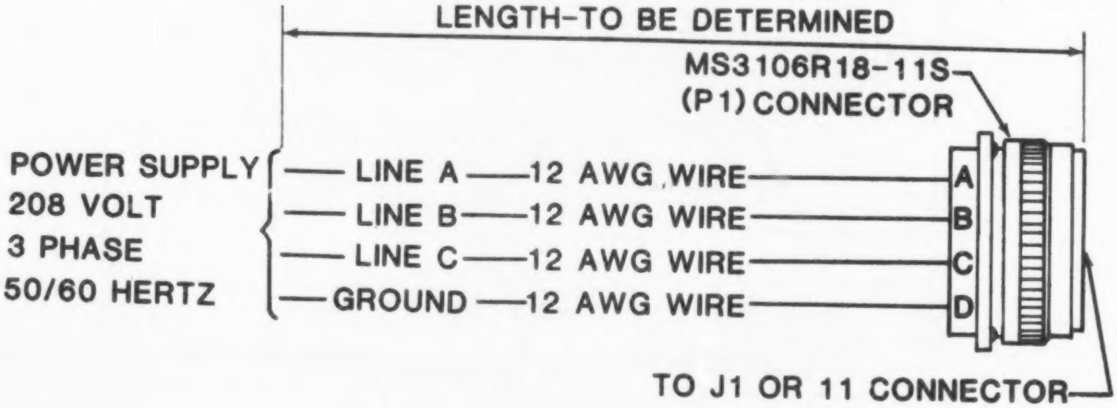

TB2
T1
CR1
C1
C2
S6
HR1
HR2
HR3
HR4
HR5
HR6
J3
P3
B3
J9
P9
L2
J8
P8
L1
J5
P5
B2
S4
S5
J4
P4
P10
J10
B1
J6
P6
J11
TB3
E3
E4
VIO
YEL
RED
WHT
BLU
BLK
EVAPORATOR SECTION
CONDENSER SECTION

Figure 4-4. Wiring Diagram (Sheet 3 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)


(97403) 13216E6177
CONNECTOR
LENGTH TO BE
DETERMINED
(97403) 13216E6209-1
CONNECTOR
SOCKET A
7 —16 AWG WIRE— 7
8 —16 AWG WIRE— 8
9 —16 AWG WIRE— 9
11 —12 AWG WIRE— 11
12 —12 AWG WIRE— 12
13 —12 AWG WIRE— 13
14 —12 AWG WIRE— 14
15 —12 AWG WIRE— 15
16 —12 AWG WIRE— 16
SOCKET A
SOCKET B
3 —20 AWG WIRE— 3
4 —20 AWG WIRE— 4
5 —20 AWG WIRE— 5
6 —20 AWG WIRE— 6
7 —20 AWG WIRE— 7
8 —20 AWG WIRE— 8
9 —20 AWG WIRE— 9
10 —20 AWG WIRE— 10
11 —16 AWG WIRE— 11
SOCKET B

INTERCONNECTING REMOTE CONTROL CABLE DIAGRAM


LENGTH-TO BE DETERMINED
MS3106R18-11S
(P1) CONNECTOR
POWER SUPPLY
208 VOLT
3 PHASE
50/60 HERTZ
LINE A —12 AWG WIRE— A
LINE B —12 AWG WIRE— B
LINE C —12 AWG WIRE— C
GROUND —12 AWG WIRE— D
TO J1 OR 11 CONNECTOR

INPUT POWER CABLE DIAGRAM

Figure 4-4. Wiring Diagram (Sheet 4 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

COMPONENT REFERENCE LIST

ELEC REF DESIG	PART NUMBER	DESCRIPTION
B1	13211E3793	COMPRESSOR
B2	13221E9334	MOTOR, CONDENSER FAN
B3	13221E9311	MOTOR, EVAPORATOR FAN
C1	M39014/05	CAPACITOR, FILTER (MIL-C-39014/5)
	-2661	
C2	13222E9171	CAPACITOR, CONDENSER RUN
C3	13222E9180	CAPACITOR, EVAPORATOR RUN
C4	13216E6239	CAPACITOR, COMPRESSOR START
C5	13222E9161	CAPACITOR, COMPRESSOR RUN
C6	13218E6961	CAPACITOR
CB1	13216E6206	CIRCUIT BREAKER, COMPRESSOR
CB2	13216E6178	CIRCUIT BREAKER, CONTROL
CR1	13227E8321	RECTIFIER, SEMICONDUCTOR DEVICE
E1	MS24693-S50	TERMINAL STUD, (CONTROL MODULE GND)
E2	MS24693-S50	TERMINAL STUD, (JUNCTION BOX GND)
E3 AND E4	MS35206-246	TERMINAL STUD, (SYSTEM GND)
HR1 THRU 6	13216E6124	HEATER ELEMENT
J1 AND J11	MS3100R-18-11P	CONNECTOR, RECEPTACLE, POWER INPUT
J2	13216E6177	CONNECTOR, RECEPTACLE, JUNCTION BOX
J3	13216E6193	CONNECTOR, RECEPTACLE, EVAPORATOR FAN
J4	13216E6193	CONNECTOR, RECEPTACLE, COMPRESSOR
J5	13216E6193	CONNECTOR, RECEPTACLE, CONDENSER FAN
J6	13216E6193	CONNECTOR, RECEPTACLE, POWER INPUT
J8	13216E6193	CONNECTOR, RECEPTACLE,
		SOLENOID VALVE BY-PASS
J9	13216E6193	CONNECTOR, RECEPTACLE,
		SOLENOID VALVE EQUALIZER
J10	PART OF B1	CONNECTOR, RECEPTACLE, COMPRESSOR
K1	13225E8024-2	RELAY, TIME DELAY
K2	MS24192-D1	RELAY, HEATER
K3	MS24192D1	RELAY, COMPRESSOR MOTOR
K4	13216E6184	RELAY, CONDENSER FAN
K5	13216E6240	RELAY, COMPRESSOR START
K6	13216E6184	RELAY, EVAPORATOR FAN
L1	13216E6158	VALVE, SOLENOID, BY-PASS
L2	13216E6158	VALVE, SOLENOID, PRESSURE EQUALIZER
P1	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P2	13216E6209	CONNECTOR, PLUG, CONTROL MODULE
P3	PART OF B3	CONNECTOR, PLUG, EVAPORATOR FAN
P4	MS3106R-20-15P	CONNECTOR, PLUG, COMPRESSOR
P5	PART OF B2	CONNECTOR, PLUG, CONDENSER FAN
P6	MS3106R-18-11S	CONNECTOR, PLUG, POWER INPUT
P8	13216E6173	CONNECTOR, PLUG, SOLENOID VALVE BY-PASS
P9	13216E6173	CONN, PLUG, SOL VALVE EQUALIZER
P10	MS3106R-20-15S	CONNECTOR, PLUG, COMPRESSOR
S1	13216E6201	SWITCH, ROTARY SELECTOR
S3	13216E6203	SWITCH, TEMPERATURE CONTROL
S4	13216E6215	SWITCH, HIGH PRESSURE CUTOUT
S5	13216E6215	SWITCH, LOW PRESSURE CUTOUT
S6	13216E6224	SWITCH, HEATER CUTOUT
T1	13221E9117	TRANSFORMER
TB1	13216E6231	TERMINAL BOARD, JUNCTION BOX
TB2	13216E6220	TERMINAL BOARD
TB3	13216E6232	TERMINAL BOARD, POWER INPUT

TO ENERGIZE THE UNIT FROM THE AUXILIARY POWER INPUT SOURCE (J11). THE LEADS ORIGINATING FROM TB1-1 AND TB1-2 ON TB3-1 AND -2 MUST BE CHANGED TO TB3-4 AND -5 RESPECTIVELY.

Figure 4-4. Wiring Diagram (Sheet 5 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

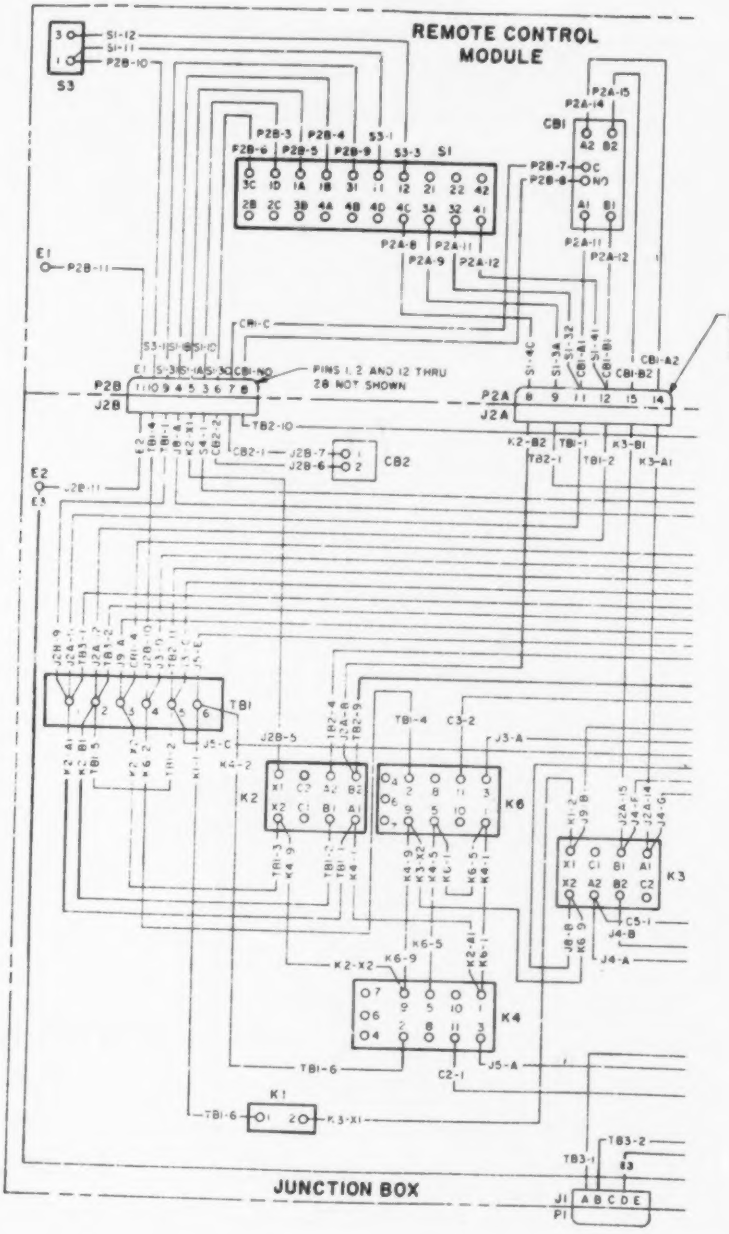

REMOTE CONTROL MODULE
S3
S1
CB1
E1
P2B
J2B
PINS 1, 2 AND 12 THRU 28 NOT SHOWN
P2A
J2A
PINS 1 THRU 7, 10, 13 AND 16 THRU 20 NOT SHOWN
CB2
E2
E3
TB1
K2
K6
K3
K4
K1
JUNCTION BOX
J1
P1

Figure 4-4. Wiring Diagram (Sheet 6 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

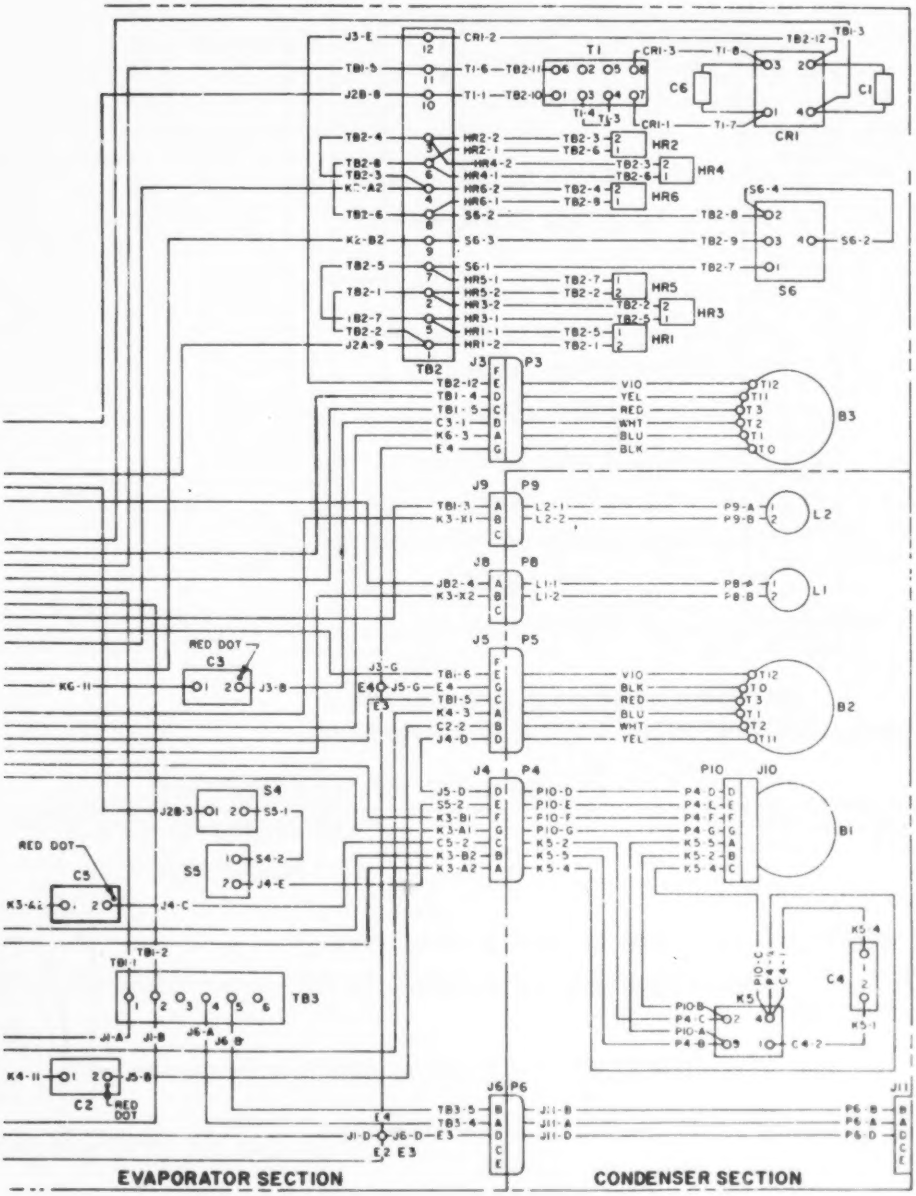
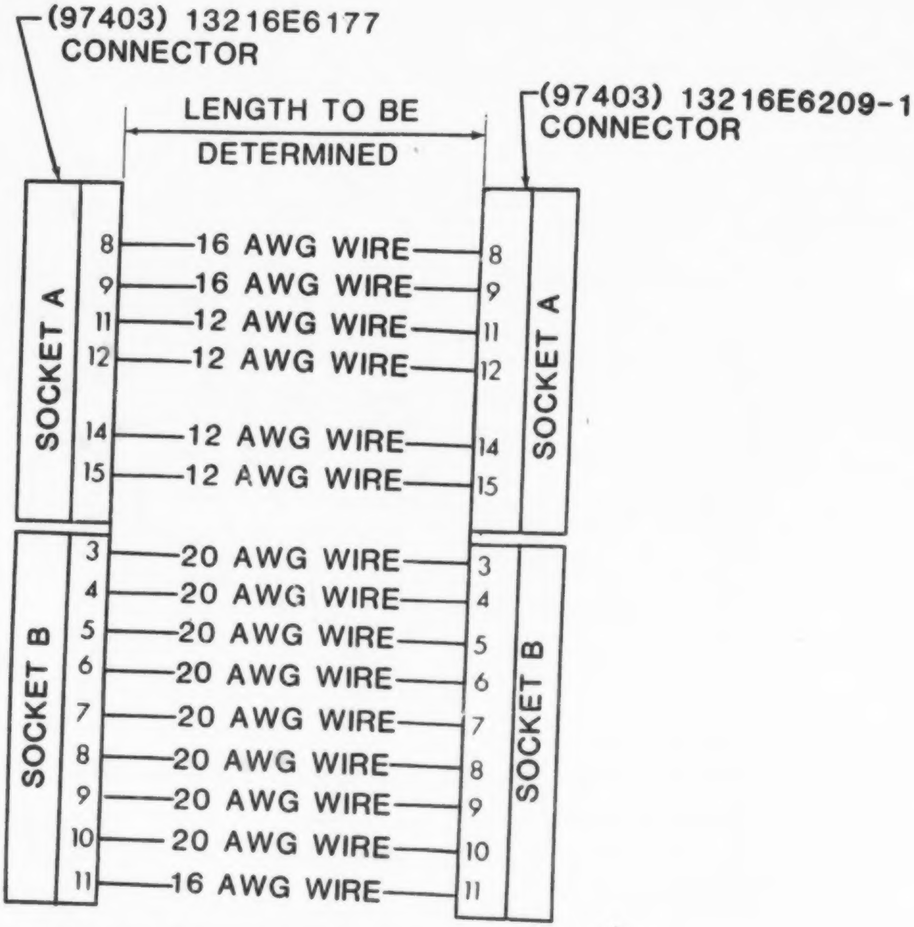
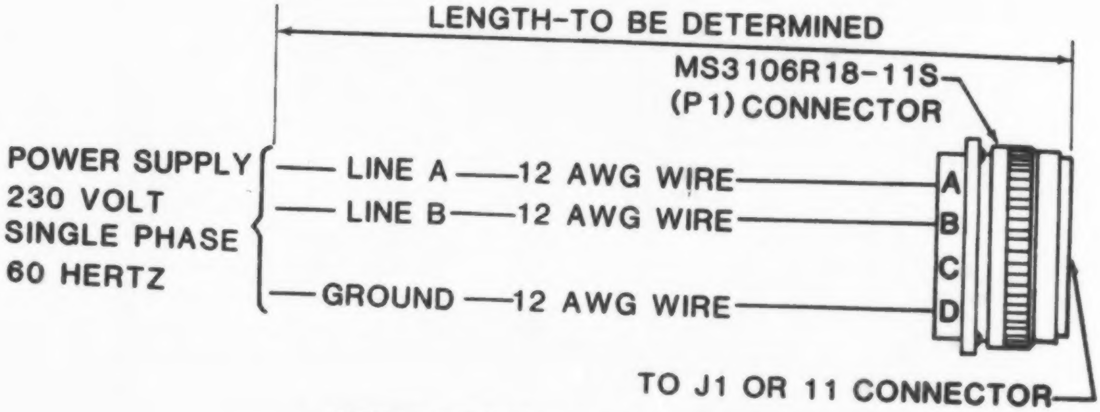

TB2
T1
C6
C1
CR1
HR2
HR4
HR6
S6
HR5
HR3
HR1
J3
P3
B3
VIO
YEL
RED
WHT
BLU
BLK
J9
P9
L2
J8
P8
L1
RED DOT
C3
J5
P5
B2
J4
P4
P10
J10
B1
S4
S5
RED DOT
C5
K5
C4
TB3
C2
RED DOT
J6
P6
J11
EVAPORATOR SECTION
CONDENSER SECTION

Figure 4-4. Wiring Diagram (Sheet 7 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)


(97403) 13216E6177
CONNECTOR
LENGTH TO BE
DETERMINED
(97403) 13216E6209-1
CONNECTOR
SOCKET A
8 16 AWG WIRE 8
9 16 AWG WIRE 9
11 12 AWG WIRE 11
12 12 AWG WIRE 12
14 12 AWG WIRE 14
15 12 AWG WIRE 15
SOCKET B
3 20 AWG WIRE 3
4 20 AWG WIRE 4
5 20 AWG WIRE 5
6 20 AWG WIRE 6
7 20 AWG WIRE 7
8 20 AWG WIRE 8
9 20 AWG WIRE 9
10 20 AWG WIRE 10
11 16 AWG WIRE 11

INTERCONNECTING REMOTE CONTROL CABLE DIAGRAM


LENGTH-TO BE DETERMINED
MS3106R18-11S
(P1) CONNECTOR
POWER SUPPLY
230 VOLT
SINGLE PHASE
60 HERTZ
LINE A 12 AWG WIRE
LINE B 12 AWG WIRE
GROUND 12 AWG WIRE
A
B
C
D
TO J1 OR 11 CONNECTOR

INPUT POWER CABLE DIAGRAM

Figure 4-4. Wiring Diagram (Sheet 8 of 8)
(Sheets 1 thru 4 are applicable to models F18H-3S, F18H-3SA, and F18H-3SB. Sheets 5 thru 8 are applicable to model F18H-1S.)

4-4. INSTALLATION INSTRUCTIONS.-Continued

b. Installation Instructions. Appropriate alterations to the facility to accommodate the selected method of installation must be completed before actual installation of the air conditioner.

(1) Shelter/Enclosure Preparation. The following information describes a typical through the wall type installation. You may want to alter these instructions to suit your specific application. (Models F18H-3S and F18H-1S only) See figure 4-5 for a through the wall installation that allows removal of the front and rear top panels for service with the unit installed.

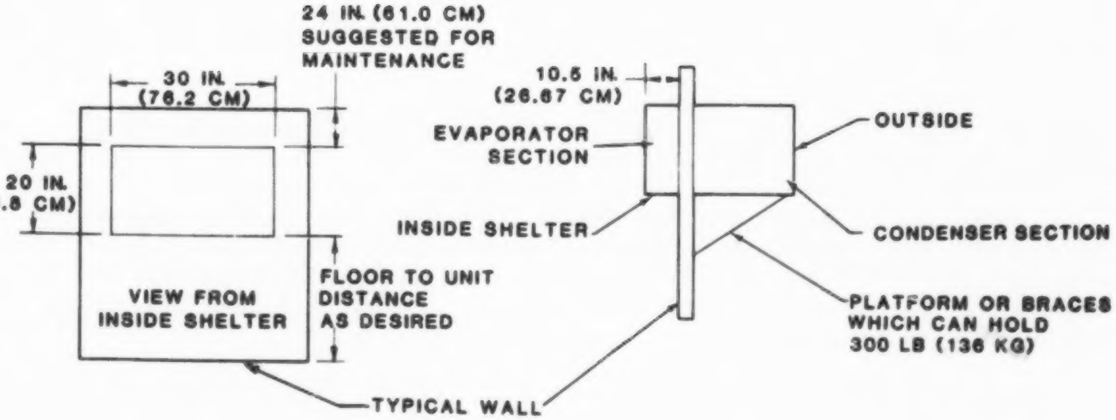

24 IN. (61.0 CM) SUGGESTED FOR MAINTENANCE
30 IN. (76.2 CM)
20 IN. (50.8 CM)
VIEW FROM INSIDE SHELTER
FLOOR TO UNIT DISTANCE AS DESIRED
10.5 IN. (26.67 CM)
EVAPORATOR SECTION
INSIDE SHELTER
OUTSIDE
CONDENSER SECTION
PLATFORM OR BRACES WHICH CAN HOLD 300 LB (136 KG)
TYPICAL WALL

Figure 4-5. Typical Through the Wall Installation

(a) Determine best location.

(b) Make cutout in wall slightly larger than overall dimension of air conditioner.

(c) Fabricate a mounting platform or braces. Provide mounting holes to match holes in bottom of air conditioner. See figure 4-1, Sheet 2.

4-4. INSTALLATION INSTRUCTIONS.-Continued

WARNING

Use care in lifting. Models F18H-3S, F18H-3SA and F18H-3SB weigh 265 lb. (120.2 kg). Model F18H-1S weighs 275 lb. (124.7 kg).

(2) Lift air conditioner into position using a lifting hoist. Use the lifting handles to work the unit into alignment with the mounting holes.

(3) Secure unit to mounting platform or braces with four sets of mounting hardware provided with unit. See figure 4-1, sheet 3, for cross section view of bottom mounting holes and hardware.

WARNING

For safe operation, connect a 10 AWG (minimum) ground wire to the air conditioner external ground. Make sure that shelter is properly grounded.

(4) Connect a 10 AWG (minimum) ground wire from shelter ground to air conditioner external ground. The air conditioner external ground connection point is located on front left side of control module. (See figure 4-3.)

(5) Fill in and seal area around the air conditioner to prevent loss of conditioned air. Flexible plastic foam and pressure sensitive tape may be used.

(6) Fabricate an input cable of required length using the MS3106R18-11S connector supplied with air conditioner for connection to J1 or J11. (See chart below and figure 4-4.) If J11 connector is used, be sure the wiring to TB3 terminal board is relocated in accordance with paragraph 4-4 a.

Models F18H-3S, F18H-3SA
and F18H-3SB

Pin	Internal Wiring Connection J1 and J11
A	Phase A
B	Phase B
C	Phase C
D	Ground
E	Blank (not used)

Model F18H-1S

Pin	Internal Wiring Connection J1 and J11
A	Phase A
B	Phase B
C	Blank (not used)
D	Ground
E	Blank (not used)

4-4. INSTALLATION INSTRUCTIONS.-Continued

(7) Remove the condensate drain plug from lower left rear corner of the unit. If air conditioner is mounted in a location where water pouring from this drain will be objectionable or create a hazard, connect a drain line at this point. The fitting used must have a male 1/8 - 27 NPT connection to unit. Hose, rigid pipe or tubing can be used to direct drain water to a more desirable disposal location.

(8) Connect power cable to proper input power source and air conditioner.

(9) Run operational checks in accordance with paragraph 2-6.

4-5. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

Lubrication.

a. General. The refrigerant compressor and its drive motor are hermetically sealed in a canister. **The compressor is supplied with a complete charge of oil and requires no lubrication.** The evaporator and condenser fan motors also have permanently lubricated, sealed bearings. No lubrication of these items is required.

b. Mechanical Lubrication. The only mechanical items which may require lubrication are the conditioned air supply and return louvers, the condenser air discharge louver and control linkages and the devices which operate the fresh air damper door. These points should be checked and lubricated, as necessary, during preventive maintenance service. A few drops of light oil should be applied to pivot points, bearing surfaces, and linkages to prevent or eliminate stiffness or binding. Be sure to wipe off all excess oil with a cloth or paper towel. These items are in an area of high volume airflow and excess oil will tend to attract and accumulate dust particles from the passing air. Graphite may be used as an alternate lubricant during extreme cold weather operation.

Section III PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-6. GENERAL.

Systematic, periodic, preventive maintenance checks and services (PMCS) are essential to insure that the air conditioner is ready for operation in any mode at all times. The purpose of a preventive maintenance program is to discover and correct defects and deficiencies before they can cause serious damage or complete failure of the equipment. Any effective preventive maintenance program must begin with the training of operators to report all unusual conditions noted during daily checks or actual operation, to organizational maintenance. All defects and deficiencies discovered during maintenance inspections must be recorded, together with corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).

4-7. INSPECTION AND SERVICE.

a. A schedule for organizational preventive maintenance inspection and service should be established immediately after installation of the air conditioner. A quarterly interval, equal to three calendar months or 250 hours of operation, whichever occurs first, is recommended for usual operating conditions. When operating under unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the interval to monthly or even less if conditions are extreme.

b. Table 4-1 lists the organizational preventive maintenance checks and services that should be performed at quarterly (or otherwise established) intervals. Figure 4-6 shows the location of PMCS items. The PMCS items in the table have been arranged and numbered in a logical sequence to provide for greater personnel efficiency and least amount of required maintenance downtime. The "Para Ref" (Paragraph Reference) column on the right side of the table provides the paragraph number where detailed, step-by-step disassembly/reassembly maintenance procedures may be found. The item number column will be used as a source of item numbers for the TM Number Column on DA Form 2404.

WARNING

Disconnect input power before disassembly of the air conditioner for PMCS to prevent dangerous, possibly fatal, electrical shock.

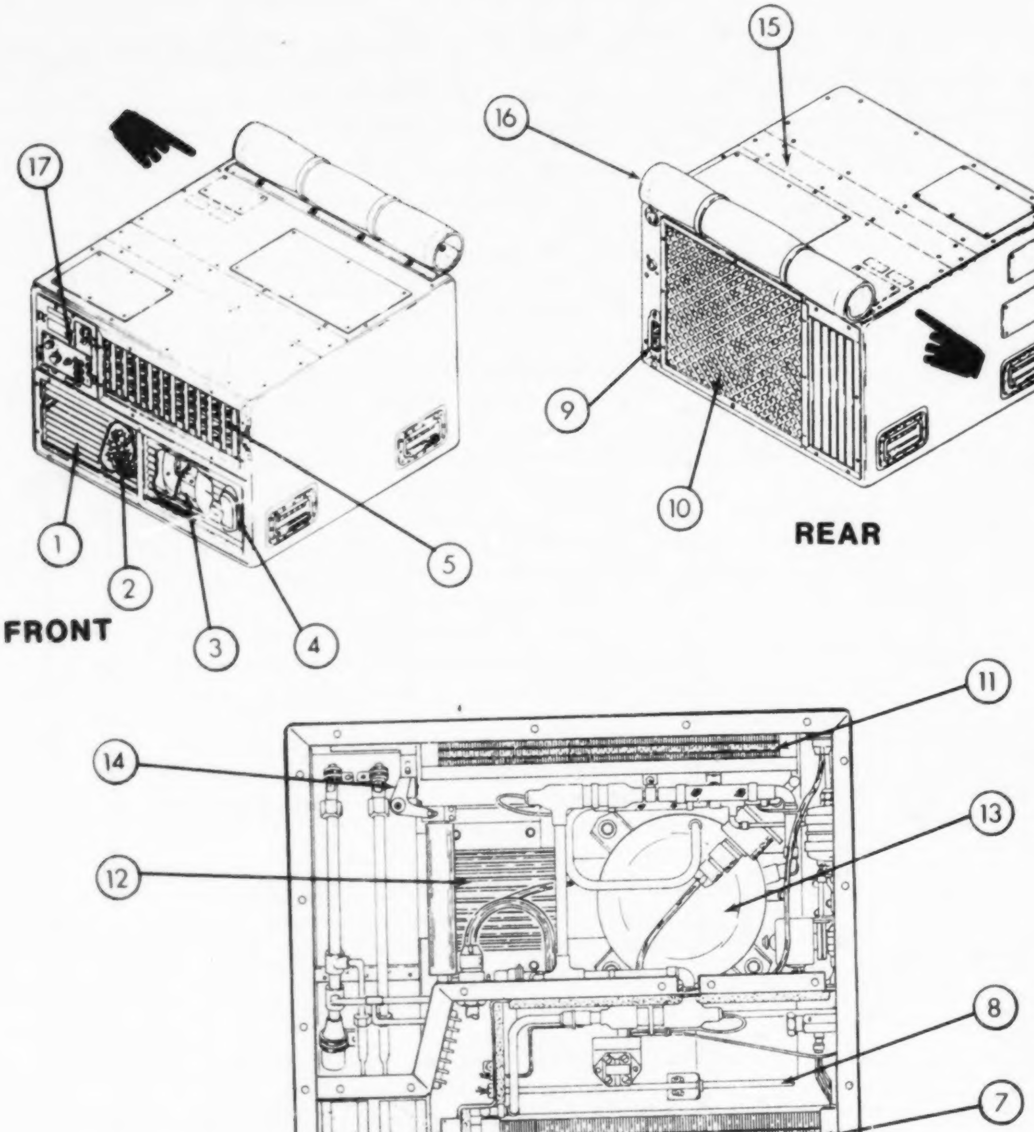

17
16
15
1
2
3
4
5
FRONT
9
10
REAR
11
14
13
12
8
7
6

Figure 4-6. Location of PMCS Items

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
1	Return Air Louver	a. Check operation of louvers for stiffness or binding. b. Remove, clean, inspect, repair, and lubricate as necessary. c. Set aside for the present and reinstall after item 4.	4-13
2	Conditioned Air Filter	a. Remove, clean, inspect, and service filter. b. Discard filter and obtain replacement, if damaged. c. Place filter aside for the present and reinstall after item 4.	4-13
3	Conditioned Air (Evaporator) Fan and Motor	a. Wipe or vacuum all dust or dirt from fan, motor, and all other components and surfaces in the area. b. Inspect fan for damaged or bent blades, the motor for signs of overheating, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	4-32
4	Condensate Drain Tubing	a. Check for loose connections, missing clamps, indications of water leaks, and damaged or missing tubing. b. Repair or replace as indicated.	4-19

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
		c. Install filter and return air louver.	
5	Conditioned Air Supply Louver	a. Check operation of louvers for stiffness or binding.	4-14
		b. Remove, clean, inspect, repair, and lubricate as necessary.	
		c. Set aside for the present and reinstall after item 8.	
6	Mist Eliminator	a. Remove, clean, and inspect top front cover. Set aside for present and reinstall after item 8.	4-16
		b. Remove, clean, inspect, and service mist eliminator.	
		c. Replace mist eliminator if it is damaged.	
		d. Set aside for the present and reinstall after item 8.	
		WARNING Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).	
7	Evaporator Coil	a. Blow accumulated dust and dirt out of air passages in evaporator coil using compressed air or the discharge side of a portable vacuum cleaner. Blow from front to back in opposite direction from operational airflow.	4-36

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
		b. Inspect coil for obvious damage and all mounting hardware for tightness and security.	
8	Heating Elements	a. Wipe or vacuum any remaining dust or dirt from heating elements, heater thermostat, and all other components and surfaces in the area. **NOTE** Use a clean, dry cloth (or one slightly moistened with water) for all wiping operations. NEVER use an oily or greasy cloth, any oily residue left on any surface will attract and accumulate much more dust and dirt than dry surfaces.	4-34
		b. Inspect heating elements and thermostat for obvious damage and all mounting hardware for tightness and security.	
		c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	
		d. Install mist eliminator, conditioned air supply louver, and top front cover.	
9	Fresh Air Ventilation Guard	a. Remove, clean, inspect, and service.	4-12
		b. Discard and obtain replacement, if damaged.	
		c. Reinstall.	

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
10	Condenser Air Inlet Guard	a. Remove, clean, inspect, and repair guard, as necessary. b. Place guard aside for the present and reinstall after item 14. **WARNING** Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2).	4-12
11	Condenser Coil	a. Blow accumulated dust and dirt out of air passages in condenser coil using compressed air or the discharge side of a portable vacuum cleaner. Blow from inside for reverse airflow direction. b. Inspect coil for obvious damage and all mounting hardware for tightness and security.	4-39
12	Condenser Fan and Motor	a. Wipe or vacuum dust and dirt from fan and motor and all other components and surfaces in the immediate area. b. Inspect fan for damage or bent blades, motor for signs of overheating, and all mounting hardware for tightness and security. c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	4-35

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
13	Compressor	a. Wipe or vacuum dust or dirt from the compressor canister and remaining components and surfaces in the lower section of the cabinet.	
		b. Inspect compressor crankcase heater element for signs of over-heating or deterioration.	
		c. Inspect wiring harness for damage or chafing and all electrical connections for tightness.	4-30
		d. Check all mounting hardware for damage or chafing.	
14	Condenser Discharge Air Louver, Linkages, and Actuator	a. Check all mounting hardware and linkage connections for tightness.	4-17
		b. Clean and lubricate as necessary.	
		c. Install condenser air inlet guard and top rear cover.	
15	Covers, Nameplates, and Housing	a. Wipe all surfaces clean.	4-11, 4-15, and 4-40
		b. Check that all Warning and instruction plates are in place and legible.	
		c. Replace missing or illegible plates.	
		d. Check that all covers are in place, that there is no missing or loose hardware and no dents, breaks, or damage that would be a hazard or interfere with unit operation.	

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
16	Fabric Cover	a. Roll down cover and inspect for tears, cracks, or any other sign of damage or deterioration. b. If washing is necessary, use fresh water with a small amount of mild detergent. c. Reroll and secure cover in the stowed position. If cover was washed, be sure it is thoroughly dry before rerolling.	4-10
17	Operational Checks	**CAUTION** Do not check operation in COOL mode until after input power has been reconnected for a sufficient time to eliminate any danger of liquid refrigerant accumulation in the compressor cylinder. Under moderate conditions, if input power has been disconnected, a four hour warm-up period should be allowed. If the air conditioner has been exposed to below freezing temperatures without input power, an eight hour warm-up period is necessary. a. Be sure MODE SELECTOR switch is in the OFF position and reconnect input power.	2-6

Table 4-1. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) QUARTERLY SCHEDULE-Continued

Item No.	Item to be Inspected/Serviced	Procedures	Para Ref.
		b. Perform functional check of air conditioner in all operational modes in accordance with the instructions in paragraph 2-6. c. Set-up air conditioner for desired operational mode. d. Record performance of quarterly PMCS, including all corrective actions taken. **NOTE** If the air conditioner has been in operation under unusual conditions, the proper interval for the above PMCS items must be reduced as necessary.	

Section IV TROUBLESHOOTING

4-8. USE OF TROUBLESHOOTING TABLE.

Table 4-2 contains troubleshooting information useful to organizational maintenance technicians in diagnosing and correcting malfunctions or unsatisfactory operation of the air conditioner.

a. The Troubleshooting Table lists the common malfunction symptoms and unsatisfactory performance characteristics technicians are most likely to encounter; test and inspection steps to be followed to determine the cause; and the corrective action(s) that should be performed for each possible cause listed.

b. The technicians should first find the malfunction symptom or unsatisfactory performance characteristic in the table which most

4-8. USE OF TROUBLESHOOTING TABLE.-Continued

closely describes the immediate situation; then perform the test and inspections, and corrective action steps in the order in which they are listed.

c. This manual cannot list all possible situations which may be encountered, nor can it list all test and inspection, and corrective action steps which may be taken. If a condition is encountered which cannot be resolved within the capabilities and experience of organizational maintenance personnel, assistance should be requested from direct support maintenance.

Table 4-2. TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

1. AIR CONDITIONER DOES NOT START IN ANY MODE.

Step 1. Check if circuit breakers are tripped.

Reset circuit breakers.

Step 2. Check if input power has been disconnected.

Connect input power.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be lethal.

CAUTION

If input power has been disconnected for an unknown period of time, do not start in COOL MODE until power has been reconnected for a minimum of four hours.

Step 3. Check for loose or damaged electrical connectors or damaged wires in wiring harnesses.

Tighten or replace connectors, or repair damaged wires.

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 4. Check that internal wiring at terminal board TB3 is wired for connector to which input power is connected.

See paragraph 4-4 and move wires if necessary.

Step 5. Check for defective circuit breaker. (See para 4-24 and 4-29.)

Replace circuit breaker if defective.

Step 6. Check for defective MODE SELECTOR switch. (See para 4-23.)

Replace switch if defective.

2. CONDITIONED (EVAPORATOR) AIR FAN DOES NOT START OR STOPS DURING OPERATION IN ANY MODE.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be lethal.

Step 1. Check operation of evaporator fan motor. (See para 4-32.)

Test motor. Replace motor if defective.

Step 2. Check operation of MODE SELECTOR switch. (See para 4-23.)

Test switch. Replace switch if defective.

Step 3. Check electrical connections and wiring. (See fig. 4-4 and para 4-20.)

Tighten or replace connectors, or repair or replace damaged wires.

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 4. Check fan for binding. (See para 4-32.)

Relieve binding or replace fan.

Step 5. Disconnect evaporator fan relay. (See fig. 4-4 and para 4-28.) Actuate primary with 24 volt dc source, then check continuity of contacts that should be closed.

Replace bad relay.

3. CONDENSER FAN FAILS TO OPERATE.

WARNING

Disconnect input power before performing internal electrical troubleshooting. Voltages used can be lethal.

Step 1. Check operation of condenser fan motor. (See para 4-35.)

Test motor. Replace motor if defective.

Step 2. Check electrical connections and wiring. (See fig. 4-4 and para 4-20.)

Tighten or replace connectors, or repair or replace damaged wires.

Step 3. Check fan for binding. (See para 4-35.)

Relieve binding or replace fan.

Step 4. Disconnect condenser fan relay. (See fig. 4-4 and para 4-28.) Actuate primary with 24 volt dc source, then check continuity of contact that should be closed.

Replace bad relay.

Table 4-2. **TROUBLESHOOTING-Continued**

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

4. INSUFFICIENT COOLING.

Step 1. Check to see that MODE SELECTOR switch is properly positioned.

Set switch to COOL.

Step 2. Check sight-glass liquid level indicator that refrigerant is colorless and clear. Yellow, milky or bubbly refrigerant indicates low level or excessive moisture.

Report condition to direct support maintenance.

Step 3. Inspect condenser coil for dirt.

Clean coil with 25-30 psi compressed air.

Step 4. Inspect evaporator return air filter for dirt. (See para 4-13.)

Clean filter.

Step 5. Check if TEMPERATURE SELECTOR switch is set incorrectly or is defective. (See para 4-22.)

Adjust setting or replace switch, or other corrective action.

Step 6. Check if supply air outlet louver is bent or stuck in closed position. (See para 4-14.)

Repair or replace louver.

Step 7. Observe evaporator fan motor for worn or defective condition. (See para 4-32.)

Report fault to direct support maintenance, or replace motor.

Step 8. Check if evaporator fan is loose or defective. (See para 4-32.)

Tighten setscrew or replace fan.

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

5. COMPRESSOR WILL NOT START.

Step 1. Check that compressor or control circuit breakers or selector switch is properly set.

Reset controls properly.

Step 2. Check if contacts of HIGH-or-LOW PRESSURE cut-out switch are open.

Reset pressure switches. Report fault to direct support maintenance if condition continues.

Step 3. Check for loose electrical connections or faulty wiring. (See fig. 4-4 and para 4-20.)

Tighten loose connections. Fix wiring if necessary.

Step 4. Make continuity check of control circuit to determine whether open circuit exists.

Fix open circuit or replace wire.

Step 5. Check continuity across primary and secondary winding of control transformer for defective windings. (See para 4-31.)

Replace bad transformer.

Step 6. Check forward and reverse resistance of rectifier assembly diodes. (See para 4-31.)

Replace bad rectifier.

Step 7. Observe operation of time delay relay. (See para 4-28.)

Replace bad relay.

Step 8. Substitute compressor relay known to be good, and check operation. (See para 4-28.)

Replace bad relay.

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 9. Test compressor motor by checking continuity of the following pins at the compressor electrical receptacle. (See fig. 4-4 for pin identifications.)

(1) Pins A and B, B and C, and C and A. Continuity should exist.

(2) Pins A, B, and C and compressor housing. No continuity should exist.

(3) Pins D and E. Continuity should exist when compressor is cool enough for internal thermostat to be closed. If compressor is hot, let cool and retest.

Report faulty motor to direct support maintenance.

6. COMPRESSOR STARTS, BUT GOES OUT ON OVERLOAD.

Step 1. Observe condenser fan motor for failure. (See para 4-35.)

Replace bad motor.

Step 2. Check for high head pressure.

Clean condenser coil and louvers. Check fan for proper operation.

7. EVAPORATOR AIR OUTPUT VOLUME LOW.

Step 1. Check for dirty or damaged filter or louvers. (See para 4-13.)

Clean or replace filter. Clean or replace louvers as required.

Step 2. Check for dirty or iced evaporator coil.

Deice and clean coil.

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 3. Inspect evaporator fan for damage. (See para 4-32.)

Replace fan.

Step 4. Check for bad fan motor. (See para 4-32.)

Replace motor.

8. CONDENSER AIR OUTLET VOLUME LOW.

Step 1. Check for dirty condenser coil or guard.

Clean coil and guard.

Step 2. Inspect condenser fan for damage. (See para 4-35.)

Replace fan.

Step 3. Check that air outlet louvers are not stuck or jammed in closed position.

Free louvers and control cable. Adjust control, or report to direct support maintenance if actuating cylinder is not working properly.

9. AIR CONDITIONER FAILS TO HEAT.

Step 1. Check MODE SELECTOR switch for improper setting.

Set MODE SELECTOR switch to LOW HEAT or HIGH HEAT.

Step 2. Make sure that TEMPERATURE SELECTOR switch is set properly.

Reset switch, if necessary.

Step 3. Check for dirty evaporator return air filter. (See para 4-13.)

Clean filter.

Step 4. Check evaporator fan motor for proper operation. (See para 4-32.)

best copy available

Table 4-2. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Replace bad motor.

Step 5. Make continuity check of TEMPERATURE SELECTOR switch or MODE SELECTOR switch. (See para 4-22 and 4-23.)

Replace bad switch.

Step 6. Inspect heaters and wiring for loose connections or damage. (See para 4-34.)

Tighten connections and fix bad wiring. Replace bad heater elements.

Step 7. Check continuity of heater relay coils. (See para 4-28.)

Replace bad relay.

Step 8. Check operation of heater high-temperature cutout thermostatic switch. It should open when temperature rises above setting. (See para 4-33.)

Replace bad thermostatic switch.

10. EXCESSIVE NOISE.

Step 1. Check evaporator or condenser fan for vibration.

Tighten fans on shafts. Tighten all mounting screws.

Step 2. Check evaporator or condenser fan motor for wear, as indicated by noisy operation or excessive side or end play. (See para 4-32 and 4-35.)

Replace worn or bad motor. (Refer to direct support maintenance for repairs.)

Step 3. Listen for compressor knocks or chatter.

Stop air conditioner and report condition to direct support maintenance.

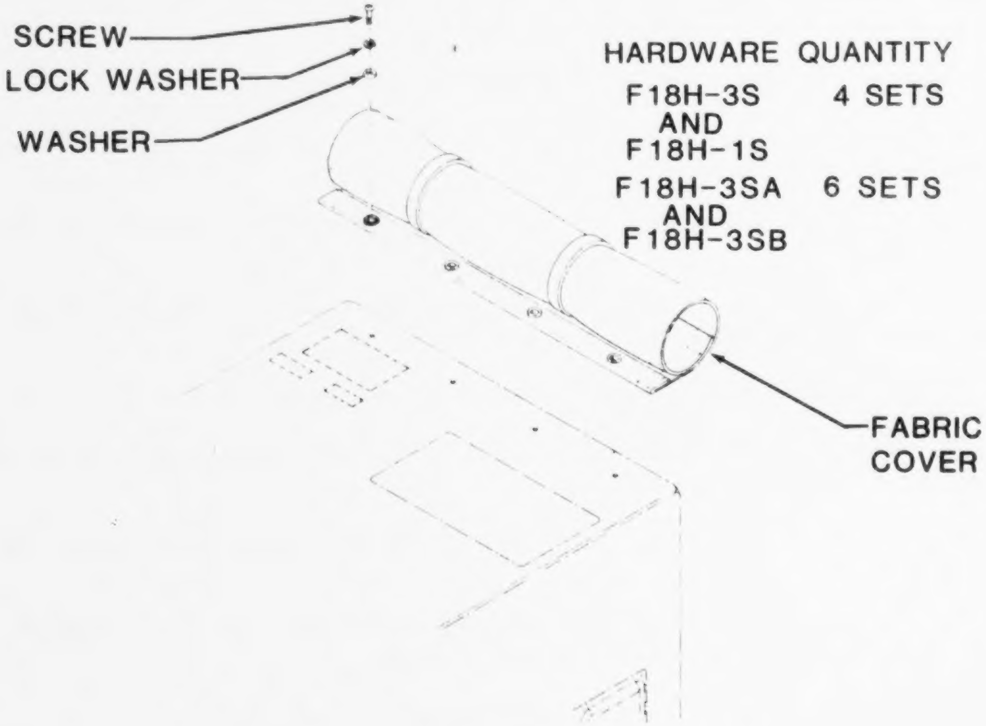
Section V MAINTENANCE PROCEDURES

4-9. GENERAL.

The procedures in this section have been arranged in the order in which the items appear in the organizational (O) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all action authorized to be performed by organizational maintenance in the order in which they appear on the MAC. Actions authorized to be performed by direct and general support maintenance have been duly noted; step-by-step procedures for these actions may be found in Chapters 5 and 6 respectively.

4-10. FABRIC COVER.

The fabric cover is made of vinyl impregnated nylon cloth. It is used to cover the exposed condenser (rear) openings during periods of shutdown or storage. (See fig. 4-7.)



HARDWARE	QUANTITY
F18H-3S AND F18H-1S	4 SETS
F18H-3SA AND F18H-3SB	6 SETS

Figure 4-7. Fabric Cover

4-10. FABRIC COVER.-Continued

a. Inspection. Inspect for rips, cuts, tears, or punctures in the fabric, and for damaged or missing snap fasteners and eyelets. Refer repair or replacement to direct support maintenance.

b. Cleaning. Wash the fabric cover using a solution of fresh water and a mild detergent. A soft scrubbing brush may be used to remove caked deposits. Thoroughly rinse with fresh water and air dry.

c. Lubrication. Apply a silicone spray lubricant to the snap fasteners, if they are difficult to open and close.

d. Removal. (Models F18H-3S and F18H-1S)

(1) Unsnap five snap fasteners.

(2) Remove four sets of screws, lock washers, and flat washers. Lift fabric cover from unit.

Removal. (Models F18H-3SA and F18H-3SB)

(1) Unsnap seven snap fasteners.

(2) Remove six sets of screws, lock washers, and flat washers. Lift fabric cover from unit.

e. Installation. (Models F18H-3S and F18H-1S)

(1) Secure fabric cover to the unit with four sets of screws, lock washers, and flat washers.

(2) If unit is to be put back into service, roll cover up and tie in place.

(3) If unit is to be stored or shut down for an extended period, roll cover down and secure snaps.

Installation. (Models F18H-3SA and F18H-3SB)

(1) Secure fabric cover to the unit with six sets of screws, lock washers, and flat washers.

(2) If unit is to be put back into service, roll cover up and tie in place.

(3) If unit is to be stored or shut down for an extended period, roll cover down and secure snaps.

4-11. TOP COVERS.

The top of the unit is enclosed with easily removed top cover(s) (See fig. 4-8.)

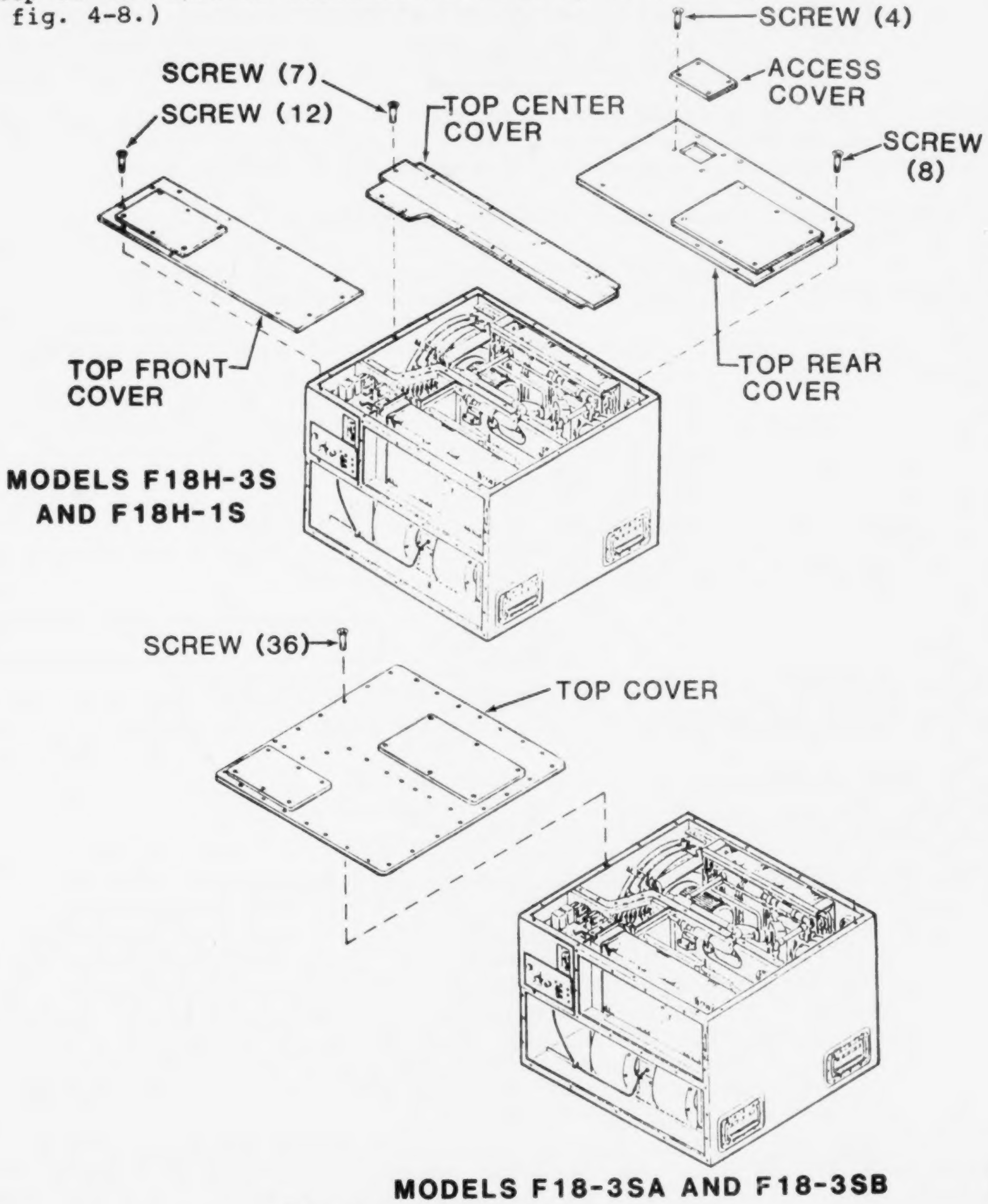

SCREW (4)
ACCESS COVER
SCREW (7)
SCREW (12)
TOP CENTER COVER
SCREW (8)
TOP FRONT COVER
TOP REAR COVER
MODELS F18H-3S AND F18H-1S
SCREW (36)
TOP COVER
MODELS F18-3SA AND F18-3SB

Figure 4-8. Top Cover(s)

4-11. TOP COVERS.-Continued

a. Removal. (Models F18H-3S and F18H-1S)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) Top rear cover and access cover can be removed independently. Top center cover must be removed last.

(3) To totally remove rear cover, first remove the fabric cover (para 4-10).

(4) Remove twelve screws and top front cover.

(5) Remove eight screws and top rear cover.

(6) Remove seven screws and top center cover.

Removal. (Models F18H-3SA and F18H-3SB)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) Remove fabric cover (para 4-10).

(3) Remove thirty six screws and top cover.

WARNING

Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).Skin, eye, and respiratory protection is required to avoid injury to personnel.

b. Cleaning. Clean the covers with a cloth dampened with a detergent solution or dry cleaning solvent (Fed Spec P-D-680). Use a soft brush if necessary to dislodge caked on dirt. Dry the items thoroughly.

4-11. TOP COVERS.-Continued

c. Inspect. Inspect top covers for breaks, cracks, dents, loose, or missing mounting hardware or other defects. Refer repairs or replacement to direct support maintenance.

d. Installation. (Models F18H-3S and F18H-1S)

(1) Install center cover first and secure with seven screws.

(2) Install front and rear top covers and secure with twenty screws.

(3) Install fabric cover (para 4-10).

(4) Connect power at power source.

Installation. (Models F18H-3SA and F18H-3SB)

(1) Install top cover and secure with thirty six screws.

(2) Install fabric cover (para 4-10).

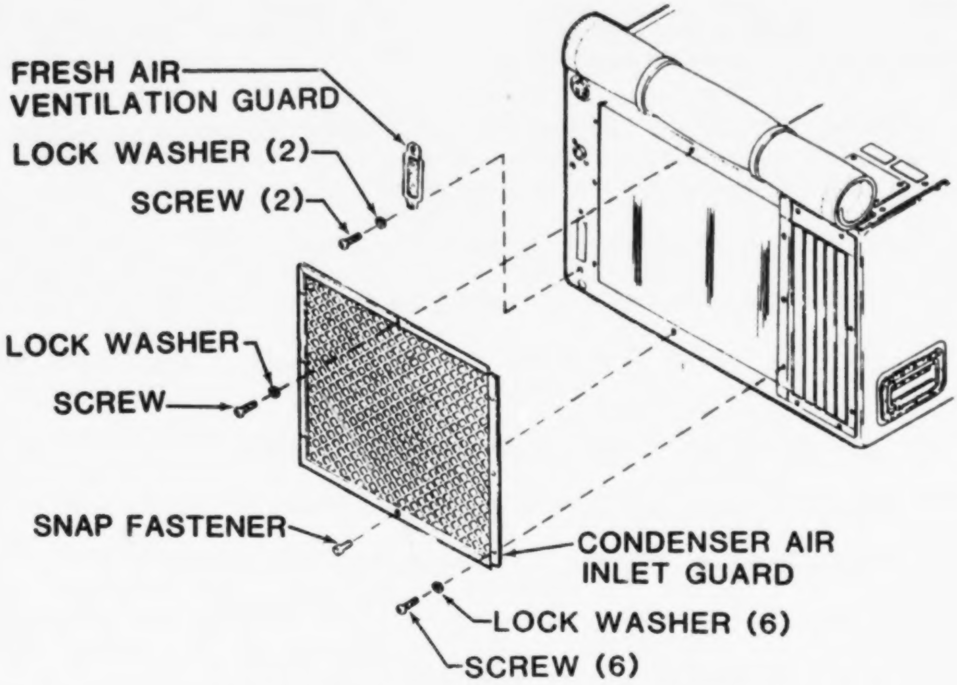
(3) Connect power at power source.

4-12. SCREENS AND GUARDS.

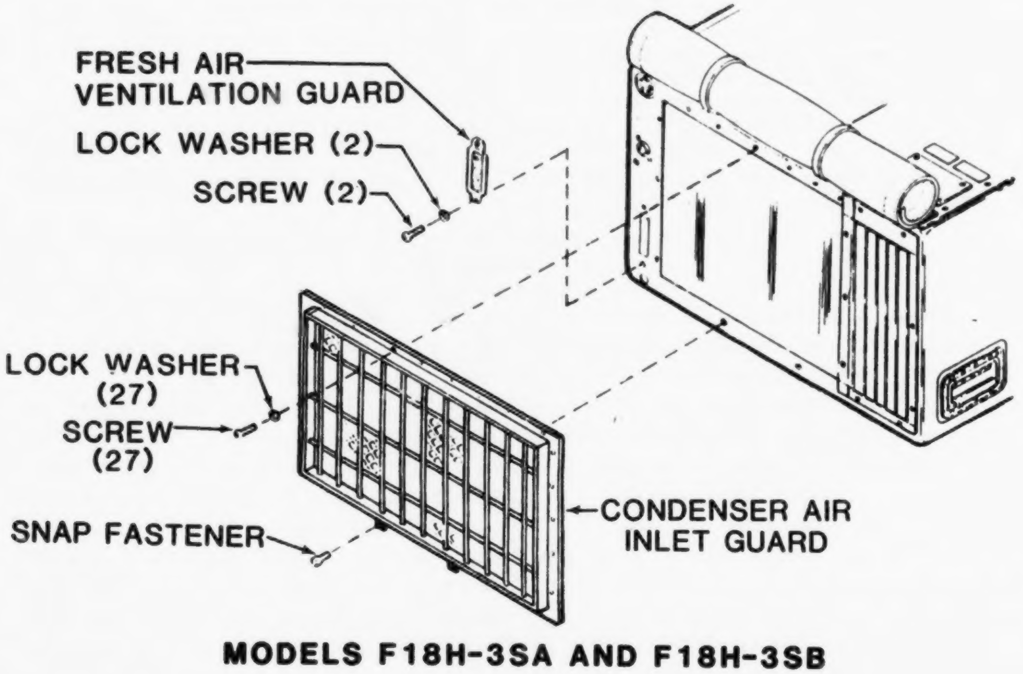
The condenser air inlet guard is located on the center rear of the unit. The fresh air ventilation guard is located on the lower left rear of the unit. (See fig. 4-9.)

WARNING

When the unit is to be operated in a chemical/biological/radiological (CBR) environment the fresh air opening must be sealed or connected to an appropriate CBR filtering device. Death or injury may result from failure to observe this warning.


FRESH AIR VENTILATION GUARD
LOCK WASHER (2)
SCREW (2)
LOCK WASHER
SCREW
SNAP FASTENER
CONDENSER AIR INLET GUARD
LOCK WASHER (6)
SCREW (6)

MODELS F18H-3S AND F18H-1S


FRESH AIR VENTILATION GUARD
LOCK WASHER (2)
SCREW (2)
LOCK WASHER (27)
SCREW (27)
SNAP FASTENER
CONDENSER AIR INLET GUARD

MODELS F18H-3SA AND F18H-3SB

Figure 4-9. Rear Screens

4-12. SCREENS AND GUARDS.-Continued

a. Removal. (Models F18H-3S AND F18H-1S)

(1) Remove two each screws and lock washers and remove the fresh air ventilation guard.

(2) Remove one each screw and lock washer and one each snap fastener from horizontal frames of condenser air inlet guard.

NOTE

The six screws on the vertical frames of the condenser air inlet guard secure the condenser coil to the air conditioner housing.

(3) Remove six each screws and lock washers from vertical frames and remove condenser air inlet guard.

Removal. (Models F18H-3SA and F18H-3SB)

(1) Remove two each screws and lock washers and remove the fresh air ventilation guard.

(2) Remove twenty seven each screws and lock washers and remove condenser air inlet guard.

4-12. SCREENS AND GUARDS.-Continued

b. Clean.

(1) Usually it is only necessary to wipe or brush the dirt from the guards.

WARNING

Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C). Skin, eye, and respiratory protection is required to avoid injury to personnel.

(2) If the guards are extremely dirty, clean with a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

c. Inspect. Check for general condition. Refer requirements for repair or replacement to direct support maintenance.

d. Installation. Secure the guards with screws and lock washers.

4-13. RETURN AIR LOUVER AND AIR FILTER.

The return air louver is located on the lower front of the unit. The air filter is clipped to the back side of the louver. (See fig. 4-10.)

a. Removal.

(1) Remove eight screws and lock washers and pull louver from unit.

(2) Remove filter from clips on back of louver.

b. Clean.

(1) Usually it is only necessary to wipe or brush the dirt from the louver. If the louver is extremely dirty, it can be washed following the same procedure as the filter.

WARNING

Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C). Skin, eye, and respiratory protection is required to avoid injury to personnel.

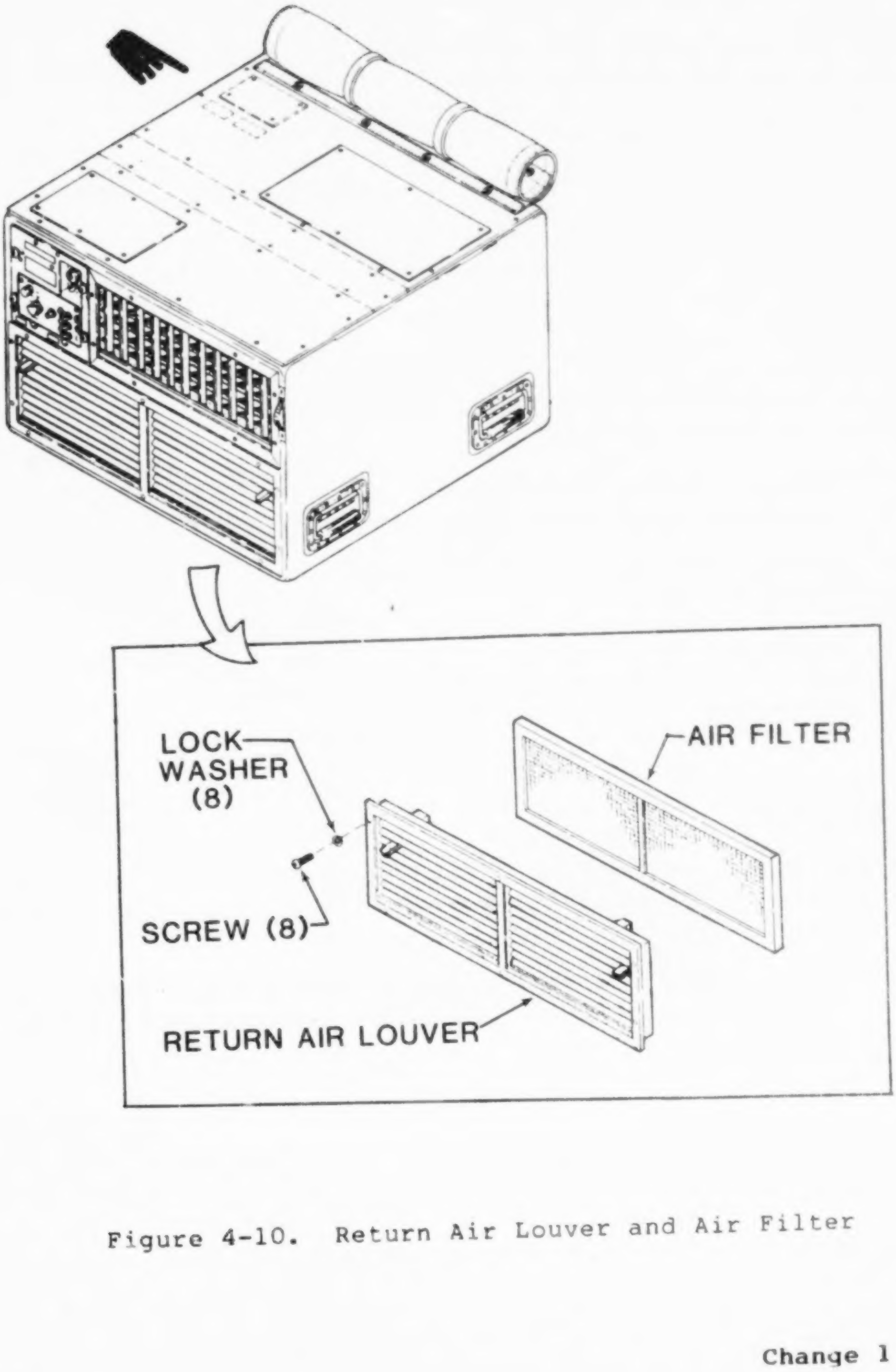

LOCK WASHER (8)
AIR FILTER
SCREW (8)
RETURN AIR LOUVER

Figure 4-10. Return Air Louver and Air Filter

4-13. RETURN AIR LOUVER AND AIR FILTER.-Continued

(2) Immerse filter in mild detergent solution or dry cleaning solvent (Fed Spec P-D-680).

(3) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(4) Rinse in clear water or clean dry cleaning solvent.

(5) Drain, then hold filter horizontal and tap each edge on bench or floor to dislodge droplets.

(6) Be sure filter is totally dry prior to installation.

c. Inspect.

(1) Check the louver for general condition. Bent louvers can usually be straightened with the fingers. Refer further repair or replacement to direct support.

(2) Inspect filter for damage. Perforations or punctures in screen and aluminum foil mesh can permit passage of unfiltered air.

(3) Inspect for packed or crushed mesh material obstructing airflow through filter.

(4) Check for deformation of the frame. Straighten if possible without crushing mesh material.

(5) Replace filter if crushed, punctured, badly deformed, or broken.

d. Servicing.

(1) Louvers. Apply a few drops of light oil to all pivot points and bearing surfaces of louvers. Wipe or blot up all excess oil with a cloth.

(2) Filter. Apply coater (Item 1, Section II, Appendix E) to the media in the filter element. Let dry and wipe off excess coater.

e. Installation.

(1) Air flow arrows should point away from louver.

(2) Place filter in retainer clips.

(3) Secure louver with screws and lock washers.

4-14. SUPPLY AIR LOUVER.

The supply air louver is located on the upper right front corner of the unit. (See fig. 4-11.)

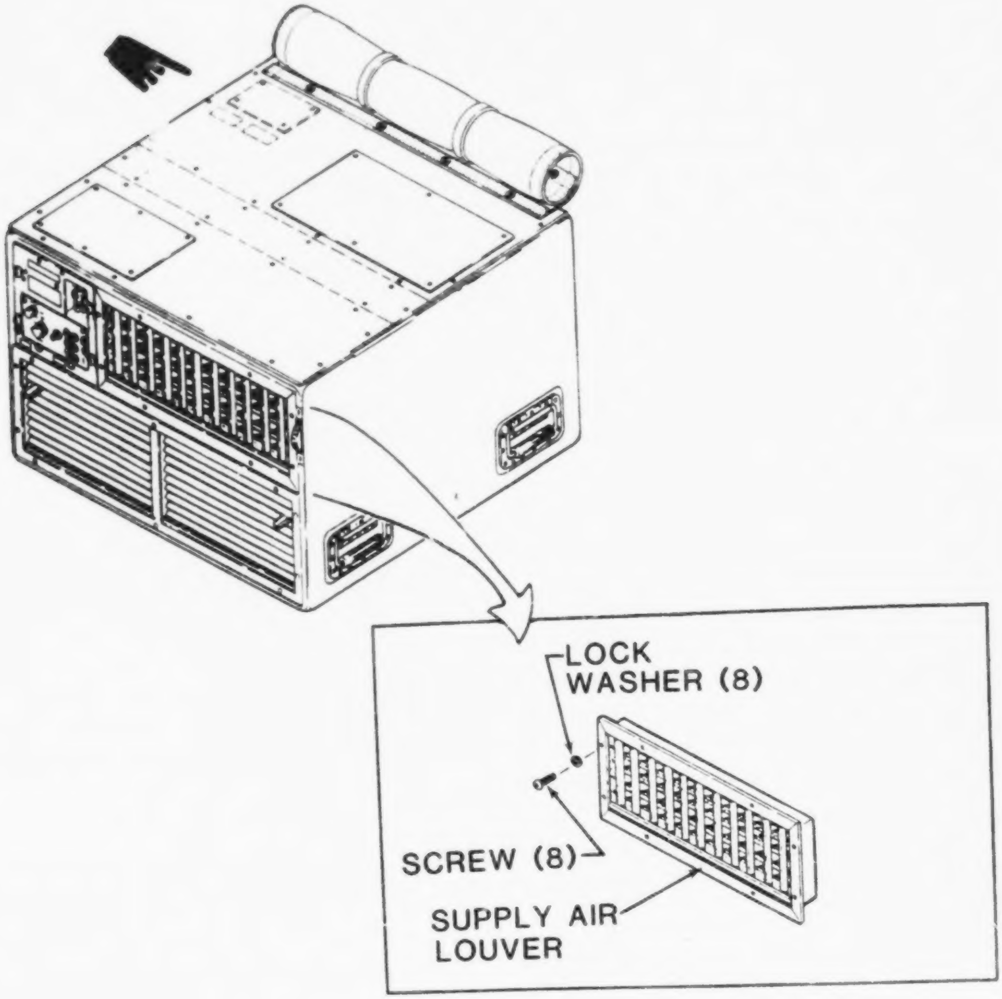

LOCK WASHER (8)
SCREW (8)
SUPPLY AIR LOUVER

Figure 4-11. Supply Air Louver

4-14. SUPPLY AIR LOUVER.-Continued

a. Removal. Remove eight screws and lock washers and pull louver from the unit.

b. Clean.

(1) Usually it is only necessary to wipe or brush dirt from louver.

WARNING

> Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C). Skin, eye, and respiratory protection is required to avoid injury to personnel.

(2) If louver is extremely dirty, immerse in a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

(3) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(4) Rinse in clean water or clean dry cleaning solvent.

(5) Dry thoroughly.

c. Inspect. Check the louver for general condition. Bent louvers can usually be straightened with the fingers. Refer requirements for further repair or replacement to direct support maintenance.

d. Servicing. Apply a few drops of light oil to all pivot points and bearing surfaces of louvers. Wipe or blot up all excess oil with a cloth.

e. Installation. Secure louver with screws and lock washers.

4-15. INFORMATION PLATES.

See figure 2-3 for location and information contained on Warning and instruction plates. If any plates are missing, damaged, or illegible, they should be replaced. Refer replacement to direct support maintenance.

4-16. MIST ELIMINATOR.

The mist eliminator traps moisture blown from the evaporator coil. It is located below the top front cover, between the evaporator coil and the supply air louver. (See fig. 4-12.)

a. Removal.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove twelve screws and top front cover. (Models F18H-3SA and F18H-3SB). Remove top cover. (See para 4-11.)

(3) Pull mist eliminator up and out of mounting frame.

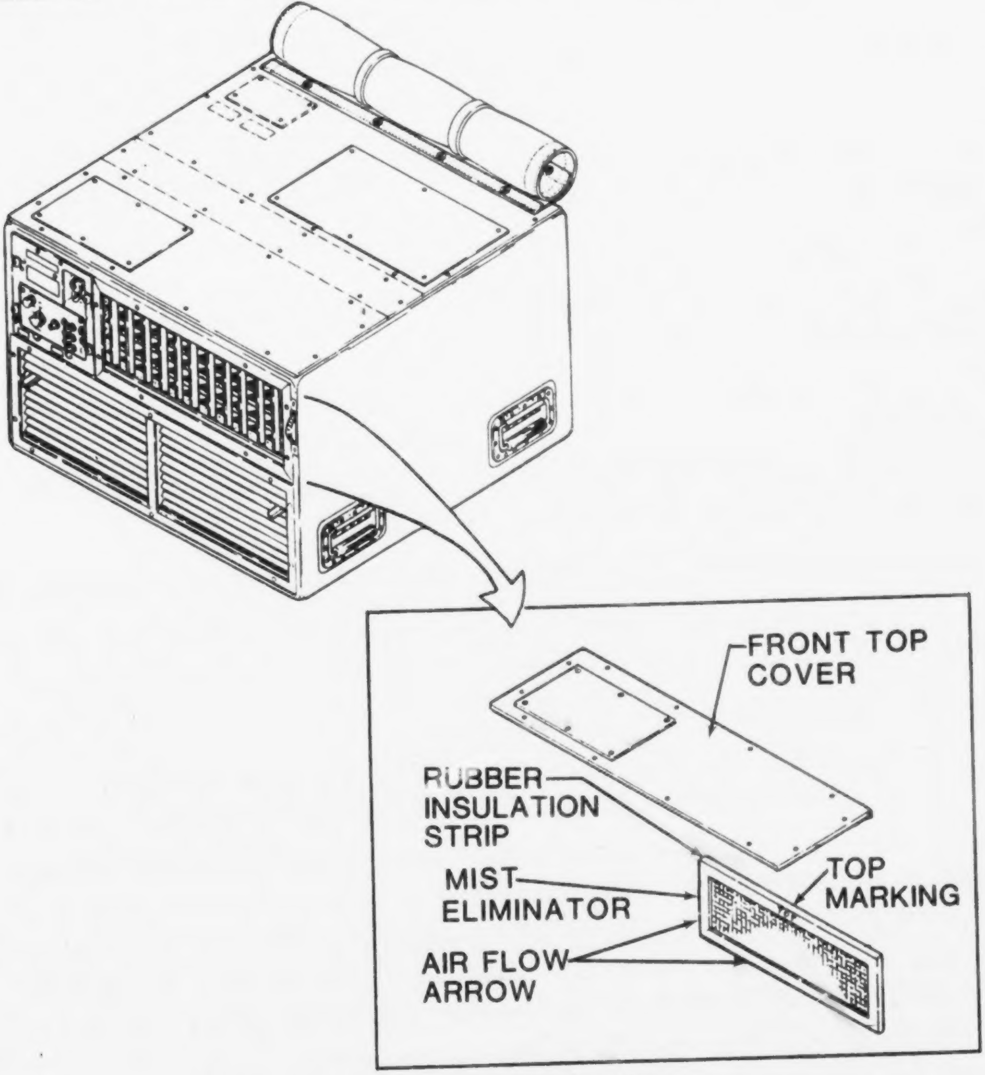

FRONT TOP COVER
RUBBER INSULATION STRIP
MIST ELIMINATOR
AIR FLOW ARROW
TOP MARKING

Figure 4-12. Mist Eliminator

4-16. MIST ELIMINATOR.-Continued

WARNING

Dry cleaning solvent (Fed Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C). Skin, eye, and respiratory protection is required to avoid injury to personnel.

b. Clean.

(1) Immerse in a detergent solution or dry cleaning solvent (Fed Spec P-D-680).

(2) Agitate until dirt is removed, using a soft brush if necessary to loosen caked-on dirt.

(3) Rinse in clean water or clean dry cleaning solvent.

(4) Drain, then hold horizontal and tap each edge on bench or floor to dislodge droplets.

c. Inspect.

(1) Inspect for damage such as perforations or punctures in the screen and aluminum.

(2) Inspect for packed or crushed material that would reduce airflow.

(3) Check for deformation of frame. Straighten if possible without crushing aluminum.

(4) Replace if crushed, punctured, badly deformed, or broken.

(5) Replace rubber insulation strip across top of mist eliminator, if it is missing or damaged.

d. Installation.

(1) TOP marking must be up and airflow arrows, located on side or bottom, must point outward away from coil.

(2) Slide mist eliminator down into mounting frames observing air flow arrows and top marking.

(3) (Models F18H-3S and F18H-1S) Install top front cover and secure with twelve screws. (Models F18H-3SA and F18H-3SB) Install top cover. (See para 4-11.)

(4) Connect power at power source.

4-17. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE.

This louver is located at the right rear of the unit and is automatically operated by a refrigerant pressure actuated cylinder and connecting linkage. The louvers open as refrigerant pressure in the condenser coil increases. This causes the louver to open more fully to increase the flow of cooler air across the condenser coil. (See fig. 4-13.)

a. Clean/Inspect.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11) and condenser air inlet guard (para 4-12).

(3) The louver can be cleaned with a soft brush or washed with water and a mild detergent solution.

(4) Check louver for bent blades, missing or damaged gaskets, and missing hardware or bearings.

(5) Clean linkage with a soft brush and damp rag.

(6) Check louver linkage for tightness and smooth operation.

b. Adjustment.

WARNING

DANGEROUS CHEMICAL is used in this equipment.

DEATH

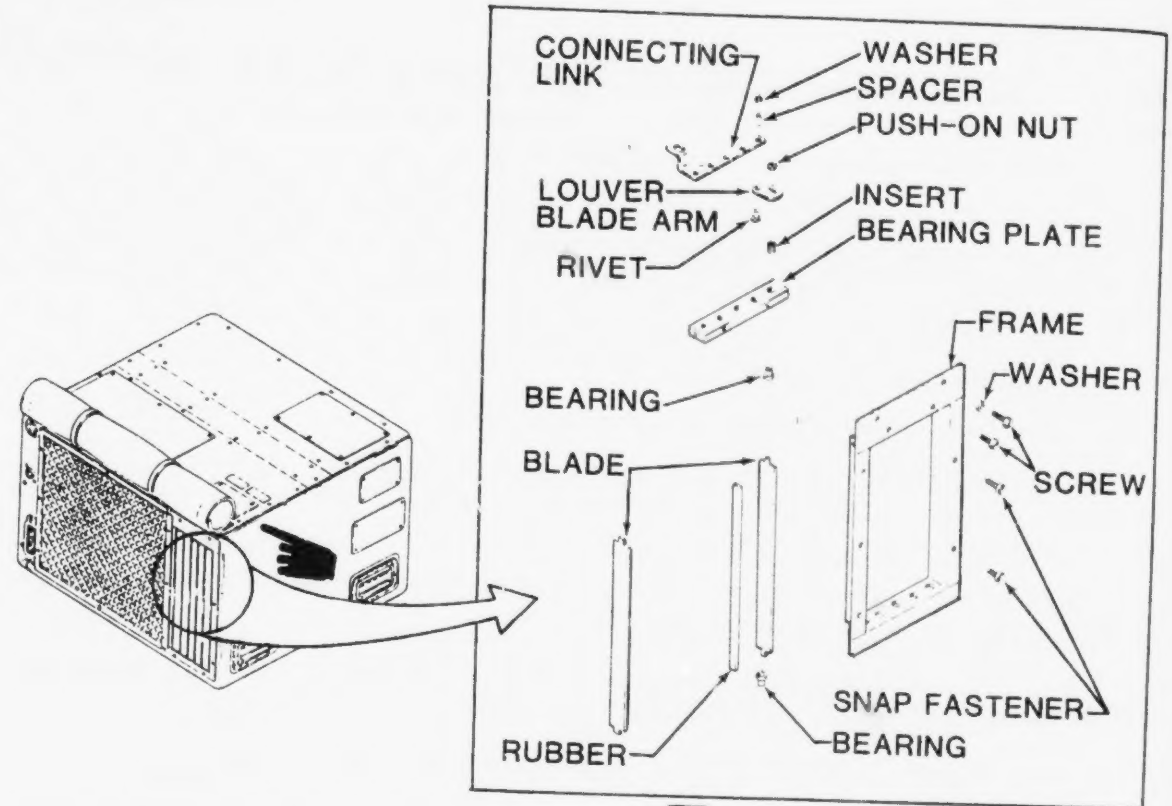
or severe injury may result if personnel fail to observe safety precautions.

Do not attempt to loosen or remove any of the connections to the copper tubing.

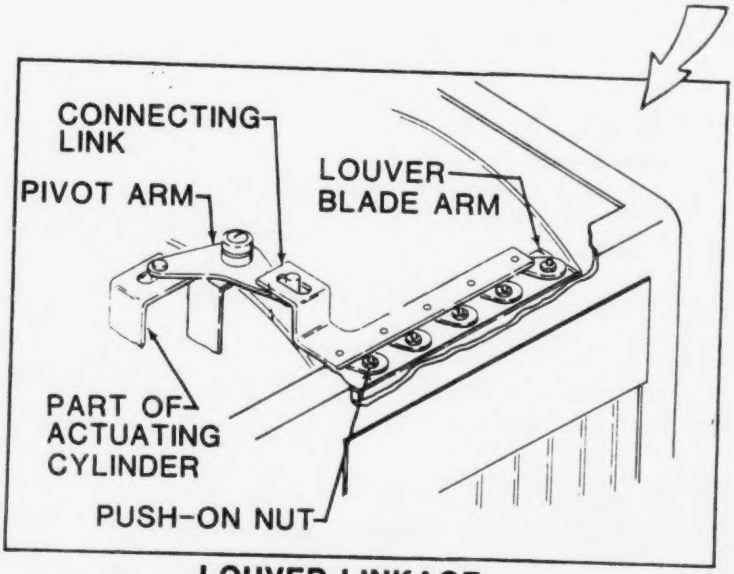
Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing.

(1) Turn air conditioner off and wait four hours or until air conditioner is uniform at an ambient temperature of less than 80°F (27°C).

(2) Loosen two nuts securing actuating cylinder to mounting bracket (fig. 5-14).


CONNECTING LINK
WASHER
SPACER
PUSH-ON NUT
LOUVER BLADE ARM
INSERT
BEARING PLATE
RIVET
FRAME
BEARING
WASHER
BLADE
SCREW
SNAP FASTENER
RUBBER
BEARING

LOUVER ASSEMBLY


CONNECTING LINK
PIVOT ARM
LOUVER BLADE ARM
PART OF ACTUATING CYLINDER
PUSH-ON NUT

LOUVER LINKAGE

Figure 4-13. Condenser Air Discharge Louver and Linkage

4-17. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE.-Continued

(3) Slide actuating cylinder towards the condenser louvers until the louvers are completely closed.

(4) Tighten two nuts securing the actuating cylinder to the mounting bracket.

(5) Louvers must be tightly closed when air conditioner is off and head pressure is below 150 psig (10.516 kg/cm^2).

c. Replacement.

WARNING

If actuating cylinder is suspected bad, contact direct support maintenance. **Do not tamper with cylinder or refrigerant tubing connections. Always wear eye and body protection when working with refrigerant gases.**

(1) Remove and replace louver blade only as follows:

NOTE

Individual Louver Blades are flexible enough for removal.

(a) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11).
(Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(b) Remove push-on nut from louver blade to be removed.

(c) Flex or spring blade to remove ends from bearings.

(d) Remove blade.

(e) Replace bearings if they are damaged.

(f) Flex or spring new blade and install.

(g) Install push-on nut.

(2) Remove louver and linkage assembly as follows:

(a) Remove condenser air inlet guard (para 4-12).

(b) Remove pivot arm by removing screw and two washers.

4-17. CONDENSER AIR DISCHARGE LOUVER AND LINKAGE.-Continued

(c) Remove five screws and lock washers and two snap fasteners from frame.

(d) Slide louver assembly from unit.

(e) Inspect all parts and replace if damaged.

(3) Install louver and linkage assembly as follows:

(a) Slide louver assembly into unit and secure with five screws and lock washers and two snap fasteners.

(b) Install pivot arm using screw and two washers.

WARNING

DANGEROUS CHEMICAL is used in this equipment.

DEATH

or severe injury may result if personnel fail to observe safety precautions.

Do not attempt to loosen or remove any of the connections to the copper tubing.

Exercise great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing.

(c) Loosen two nuts securing actuating cylinder to mounting bracket (fig. 5-14).

(d) Slide actuating cylinder towards the condenser louvers until the louvers are completely closed.

(e) Tighten two nuts securing the actuating cylinder to the mounting bracket.

(f) Install condenser air inlet guard (para 4-12).

(g) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11).
(Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(h) Connect power at power source.

4-18. FRESH AIR DAMPER AND ACTUATOR.

The wheel type actuator plate located on the upper right front of the unit controls the internal fresh air damper. Turn up to close and down to open. (See fig. 4-14.)

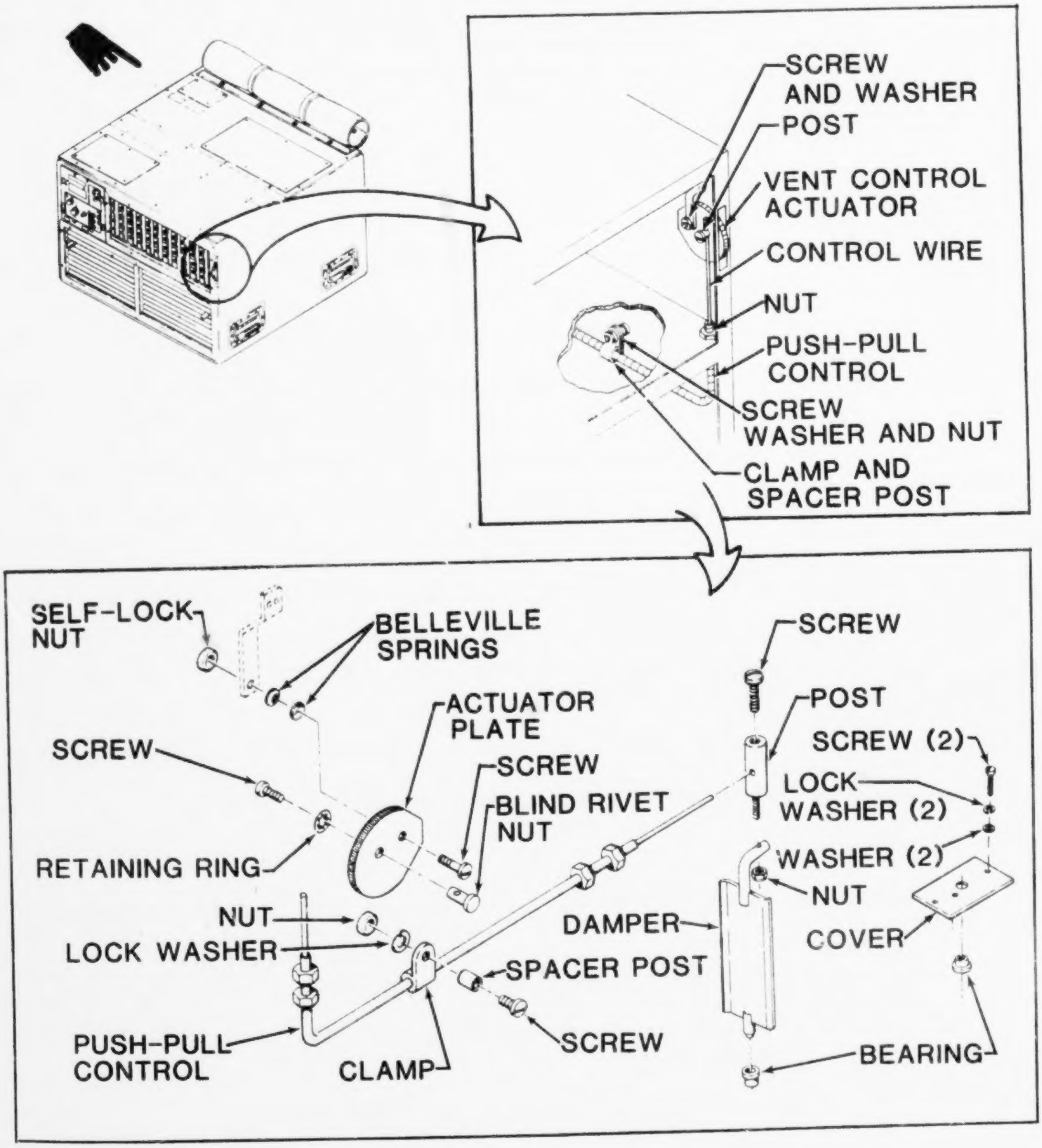

SCREW AND WASHER
POST
VENT CONTROL ACTUATOR
CONTROL WIRE
NUT
PUSH-PULL CONTROL
SCREW WASHER AND NUT
CLAMP AND SPACER POST
SELF-LOCK NUT
BELLEVILLE SPRINGS
ACTUATOR PLATE
SCREW
SCREW
BLIND RIVET NUT
RETAINING RING
NUT
LOCK WASHER
PUSH-PULL CONTROL
CLAMP
SPACER POST
SCREW
DAMPER
SCREW
POST
SCREW (2)
LOCK WASHER (2)
WASHER (2)
NUT
COVER
BEARING

Figure 4-14. Fresh Air Damper and Actuator

4-18. FRESH AIR DAMPER AND ACTUATOR.-Continued

a. Clean/Inspect.

(1) Disconnect power at power source.

(2) Remove top covers (para 4-11), supply air louver (para 4-13), and return air louver (para 4-14).

(3) Wipe loose dirt from controls and linkages with a clean cloth.

(4) Check push-pull control for operation by turning actuator plate.

(5) Check that damper arm moves when actuator plate is turned.

b. Removal.

(1) Loosen screw on mechanical post and disconnect push-pull control.

(2) Remove two screws, lock washers, and flat washers and lift damper from air conditioner.

(3) Remove screw, lock washer, nut, spacer and loop clamp.

(4) Loosen screw in actuator plate blind nut to free end of push-pull control.

(5) Remove outer nuts from both ends of push-pull control and remove push-pull control from unit.

(6) Remove screw, nut, two spring washers and actuator plate.

c. Replace. Inspect all parts and replace if damaged.

d. Installation.

(1) Install actuator plate with screw, two spring washers, and nut.

(2) Install damper in opening of housing.

(3) Secure damper cover to housing with two screws lock washers and flat washers.

4-18. FRESH AIR DAMPER AND ACTUATOR.-Continued

(4) With one nut on each end of push-pull control, install ends of control through openings in housing.

(5) Install outer nuts on push-pull control and insert ends into mechanical posts of damper and actuator plate.

(6) Tighten outer nuts on push-pull control.

(7) Install loop clamp, spacer, screw, nut, and washer.

e. Adjustment.

(1) Loosen screw on both mechanical posts to release push-pull control cable ends.

(2) Move arm on damper in both directions and determine the center between the two extreme stop points.

(3) Move actuator plate so that it is also centered on the curved portion of the plate.

(4) Tighten screws in both mechanical posts.

(5) Check actuator plate for smooth operation.

(6) Install top covers (para 4-11), supply air louver (para 4-14), and return air louver (para 4-13).

(7) Connect power at power source.

4-19. CONDENSATE DRAIN.

(See fig. 4-15.)

a. Removal.

(1) Disconnect power at power source.

(2) Remove return air louver (para 4-13).

(3) Remove clamps.

(4) Pull tubing loose from connection points in drain pan and housing.

b. Inspection.

(1) Check tubing for cuts, splits, and deteriorated condition.

(2) Check that aluminum tube from bulkhead to rear of unit is not clogged.

c. Replace. Replace all damaged parts found during inspection.

d. Installation.

(1) Slide clamps onto tubes.

(2) Slip tubing and clamps into place.

(3) Install the return air louver (para 4-13).

(4) Connect power at power source.

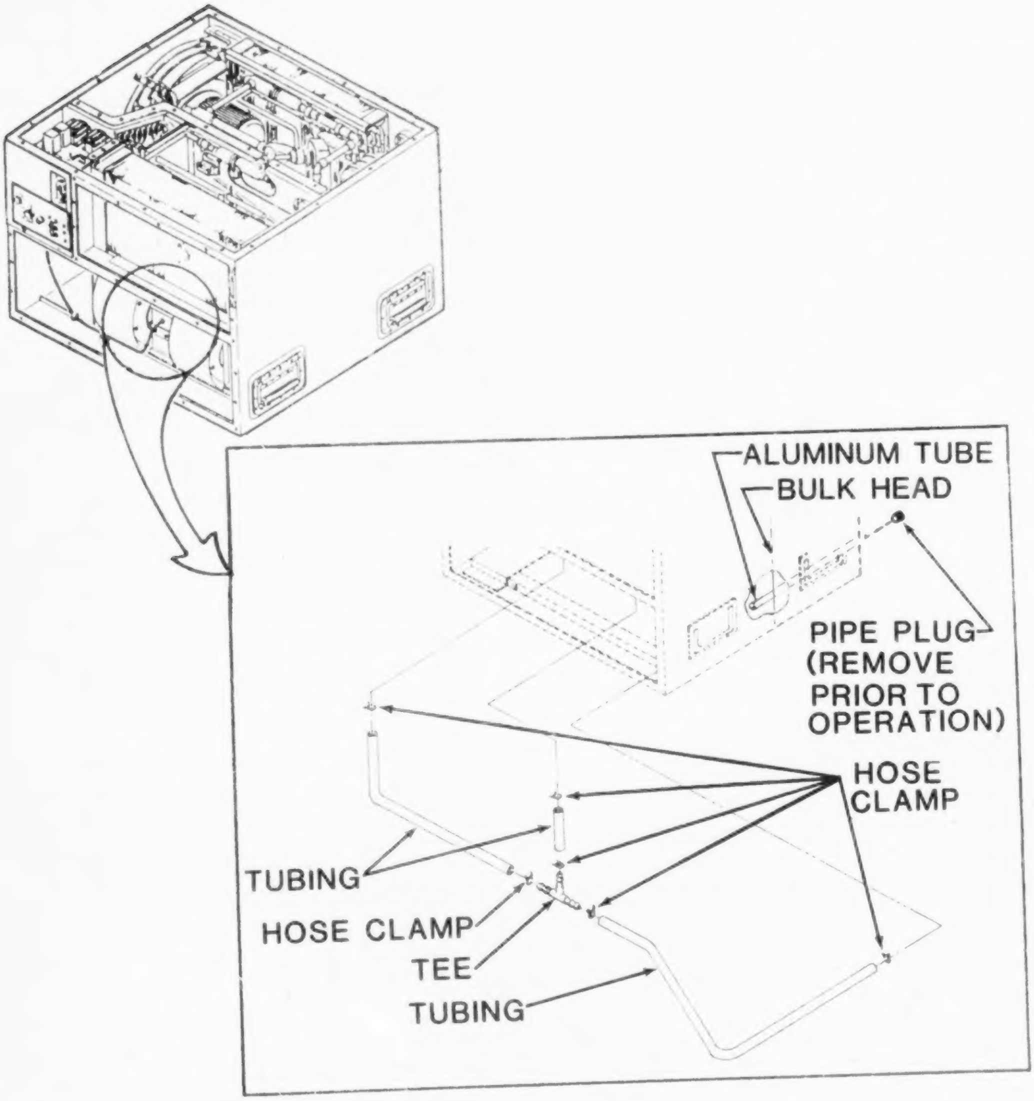

ALUMINUM TUBE
BULK HEAD
PIPE PLUG (REMOVE PRIOR TO OPERATION)
HOSE CLAMP
TUBING
HOSE CLAMP
TEE
TUBING

Figure 4-15. Condensate Drain Lines

4-20. ELECTRICAL WIRING REPAIR - GENERAL.

Preferred repair methods consist of replacing wires, terminals, connectors, etc., rather than splicing wires, bending ends to form terminals, and other make-shift procedures, although the latter may be appropriate for emergency field repairs. Determine the proper size and length of wire, or the terminal, or connector to be used for replacement by referring to Table 4-3, "Wire List", and to the wiring diagram figure 4-4.

a. Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-F-14256, rosin base flux, item 6, Appendix E and should be brushed onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical solder. If an uncored solder is used, it should be a lead-tin solder, item 7, Appendix E conforming to Specification QQ-S-571. Wires should always be heated to the point at which the solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

b. Insulating Joints. The preferred method of insulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a length of 1 inch (2.5 cm) for covering joints at terminals or connectors, or to a length about 1/2 inch (1.3 cm) longer than the joint to be insulated. Slide the tubing over the wire before making the joint. After the joint is made, slide the tubing so that it covers the joint, and shrink in place with moderate heat.

c. Splicing Wires. To repair broken or cut wires that are otherwise sound, the mating ends can be stripped and spliced. A commercial butt splice can be crimped onto the ends to joint them, or a "Western Union" wire splice can be made. The latter is made by stripping 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the wire ends, and sliding on a piece of insulation tubing as described above. Hold the ends parallel and facing opposite directions, then twist each end around the other wire at least three turns. Solder and apply insulation as described above.

d. Crimping Terminals. To install a terminal on the end of a wire, strip 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the end of the wire, apply a one-inch (2.5 cm) piece of heat-shrink tubing (if the terminals are of the uninsulated type). Insert wire-end into the shank of the terminal. Crimp the shank and install heat-shrink tubing, if necessary.

Table 4-3. WIRE LIST

Termination		Termination		AWG Wire Size	Length	
From	Terminal Type	To	Terminal Type		IN.	CM
LOOSE WIRES						
S1-12	13216E6191-1	S3-3	MS25036-149	20	10	25.4
S1-11	13216E6191-1	S3-1	MS25036-149	20	7	17.8
S6-4	MS25036-108	S6-2	MS25036-108	16	2	5.1
S6-3	MS25036-108	TB2-9	13216E6191-2	16	18	45.7
S6-1	MS25036-108	TB2-8	13216E6191-2	16	18	45.7
S6-2	MS25036-108	TB2-7	13216E6191-2	16	18	45.7
T1-3	-	T1-4	-	20	4	10.2
AUXILIARY POWER CABLE ASSEMBLY						
J11-A	-	P6-A	-	12	40	101.6
J11-B	-	P6-B	-	12	40	101.6
J11-C	-	P6-C	-	12	40	101.6
J11-D	-	P6-D	-	12	40	101.6
COMPRESSOR WIRING HARNESS						
P4-A	-	P10-A	-	12	22	55.9
P4-B	-	P10-B	-	12	22	55.9
P4-C	-	P10-C	-	12	22	55.9
P4-D	-	P10-D	-	20	22	55.9
P4-E	-	P10-E	-	20	22	55.9
P4-F	-	P10-F	-	16	22	55.9
P4-G	-	P10-G	-	16	22	55.9
TRANSFORMER AND RECTIFIER WIRING HARNESS						
T1-2	-	TB2-10	13216E6191-1	20	13	33.1
T1-5	-	TB2-11	13216E6191-1	20	13	33.1
CR1-2	13216E6191-1	TB2-12	13216E6191-1	20	17	43.2
T1-7	-	CR1-1	13216E6191-1	20	9	22.9
T1-8	-	CR1-3	13216E6191-1	20	9	22.9
K5-X2	MS25036-101	CR1-4	13216E6191-1	20	17	43.2

Table 4-3. WIRE LIST-Continued

Termination		Termination		AWG Wire Size	Length	
From	Terminal Type	To	Terminal Type		IN.	CM
CONTROL MODULE HARNESS						
P2A-7	-	S1-3A	13216E6191-2	16	8	20.3
P2A-8	-	S1-4C	13216E6191-2	16	9	22.9
P2A-9	-	S1-4A	13216E6191-2	16	8	20.3
P2A-11	-	CB1-A1	13216E6191-3	12	5	12.7
P2A-11	-	S1-32	13216E6191-2	16	10	25.4
P2A-12	-	CB1-B1	13216E6191-3	12	5	12.7
P2A-12	-	S1-41	13216E6191-2	16	8	20.3
P2A-13	-	CB1-C1	13216E6191-3	12	5	12.7
P2A-13	-	S1-42	13216E6191-2	16	9	22.9
P2A-14	-	CB1-A2	13216E6191-3	12	5	12.7
P2A-15	-	CB1-B2	13216E6191-3	12	5	12.7
P2A-16	-	CB1-C2	13216E6191-3	12	5	12.7
P2B-3	-	S1-1D	13216E6191-1	20	8	20.3
P2B-4	-	S1-1B	13216E6191-1	20	8	20.3
P2B-5	-	S1-1A	13216E6191-1	20	10	25.4
P2B-6	-	S1-3C	13216E6191-1	20	10	25.4
P2B-7	-	CB1-C	13216E6192	20	7	17.8
P2B-8	-	CB1-NO	13216E6192	20	7	17.8
P2B-9	-	S1-31	13216E6191-1	20	10	25.4
P2B-10	-	S3-1	MS25036-149	20	9	22.9
P2B-11	-	E1	MS25036-153	16	7	17.8
CONNECTOR (J6) WITH LEADS						
J6-A	-	TB3-4	MS25036-156	12	7	17.8
J6-B	-	TB3-5	MS25036-156	12	7	17.8
J6-C	-	TB3-6	MS25036-156	12	7	17.8
J6-D	-	E3	MS25036-156	12	7	1[illegible]8
JUNCTION BOX HARNESS						
J1-A	-	TB3-1	MS25036-156	12	38	96.5
J1-B	-	TB3-2	MS25036-156	12	37	94.0
J1-C	-	TB3-3	MS25036-156	12	37	94.0
J1-D	-	E3	MS25036-156	12	39	94.[illegible]
J2A-7	-	TB2-3	13216E6191-2	16	29	73.[illegible]
J2A-8	-	TB2-2	13216E6191-2	16	28	71.1
J2A-9	-	TB2-1	13216E6191-2	16	28	71.1
J2A-11	-	TB1-1	13216E6191-3	12	21	53.3

Table 4-3. WIRE LIST-Continued

Termination		Termination		AWG Wire Size	Length	
From	Terminal Type	To	Terminal Type		IN.	CM
		JUNCTION BOX HARNESS CONTINUED				
J2A-12	-	TB1-2	13216E6191-3	12	21	53.3
J2A-13	-	TB1-3	13216E6191-3	12	20	50.8
J2A-14	-	K3-A1	MS25036-112	12	11	27.9
J2A-15	-	K3-B1	MS25036-112	12	12	30.5
J2A-16	-	K3-C1	MS25036-112	12	12	30.5
J2B-3	-	TB1-5	13216E6191-1	20	21	53.3
J2B-4	-	J8-A	-	20	34	86.4
J2B-5	-	K2-X1	MS25036-101	20	22	55.9
J2B-6	-	CB2-1	MS25036-101	20	18	45.7
J2B-7	-	CB2-2	MS25036-101	20	18	45.7
J2B-8	-	TB2-10	13216E6191-1	20	34	86.4
J2B-9	-	TB1-2	13216E6191-1	20	23	58.4
J2B-10	-	TB1-4	13216E6191-1	20	21	53.3
J2B-11	-	E2	MS25036-153	16	25	63.5
J3-A	-	K5-1	-	16	23	58.4
J3-B	-	K5-11	-	16	23	58.4
J3-C	-	K5-8	-	16	23	58.4
J3-D	-	TB1-4	13216E6191-1	20	26	66.0
J3-E	-	TB2-12	13216E6191-1	20	28	71.1
J3-G	-	E4	MS25036-153	16	23	58.4
J4-A	-	K3-A2	MS25036-112	12	37	94.0
J4-B	-	K3-B2	MS25036-112	12	37	94.0
J4-C	-	K3-C2	MS25036-112	12	39	99.1
J4-D	-	J5-D		20	8	20.3
J4-E	-	S5-2	13216E6191-1	20	53	134.6
J4-F	-	K3-A1	MS25036-108	16	30	76.2
J4-G	-	K3-B1	MS25036-108	16	29	73.7
J5-A	-	K4-1	-	16	34	86.4
J5-B	-	K4-11	-	16	34	86.4
J5-C	-	K4-8	-	16	34	86.4
J5-E	-	TB1-6	13216E6191-1	20	36	91.4
J5-G	-	E4	MS25036-153	16	14	35.6
J8-B	-	K3-X2	MS25036-149	20	28	71.1
J9-A	-	K3-X2	MS25036-149	20	30	76.2
J9-B	-	K4-9	MS25036-149	20	30	76.2
TB1-1	13216E6191-2	K2-A1	MS25036-153	16	19	48.3
TB1-2	13216E6191-3	TB3-2	MS25036-156	12	44	111.8
TB1-2	13216E6191-2	K2-B1	MS25036-153	16	18	45.7

Table 4-3. WIRE LIST-Continued

Termination		Termination		AWG Wire Size	Length	
From	Terminal Type	To	Terminal Type		IN.	CM
	JUNCTION BOX HARNESS CONTINUED					
TB1-3	13216E6191-3	TB3-3	MS25036-156	12	43	109.2
TB1-3	13216E6191-1	TB2-11	13216E6191-1	20	36	91.4
TB1-3	13216E6191-2	K2-C1	MS25036-153	16	19	48.3
TB1-5	13216E6191-1	S4-1	13216E6191-1	20	31	78.7
TB1-6	13216E6191-1	K1-2	-	20	10	25.4
TB2-4	13216E6191-2	K2-C2	MS25036-153	16	35	88.9
TB2-5	13216E6191-2	K2-B2	MS25036-153	16	34	86.4
TB2-6	13216E6191-2	K2-A2	MS25036-153	16	34	86.4
K1-1	-	K3-X1	MS25036-149	20	7	17.8
K2-A1	MS25036-153	K4-3	-	16	11	27.9
K2-X2	MS25036-101	K3-X2	MS25036-149	20	16	40.6
K2-X2	MS25036-101	K4-2	-	20	12	30.5
TB1-1	13216E6191-3	TB3-1	MS25036-156	12	46	116.8
K4-2	-	K5-2	-	20	6	15.2
K4-3	-	K5-3	-	16	6	15.2
K4-5	-	K5-5	-	16	6	15.2
K4-5	-	K5-B1	MS25036-153	16	11	27.9
K4-9	-	TB1-6	13216E6191-1	20	14	35.6
K4-10	-	K2-C1	MS25036-1531	16	13	33.0
K4-10	-	K5-10	-	16	6	15.2
K5-9	-	TB1-4	13216E6191-1	20	13	33.0
S5-1	13216E6191-1	S4-2	13216E6191-1	20	21	53.3
E3	MS25036-153	E2	MS25036-153	16	46	116.8
E3	MS25036-153	E4	MS25036-153	16	20	50.8

4-21. CONTROL MODULE.

The control module is normally located in the upper left front corner of the unit. (See fig. 4-16.) It can be remote mounted, see paragraph 4-4a(2).

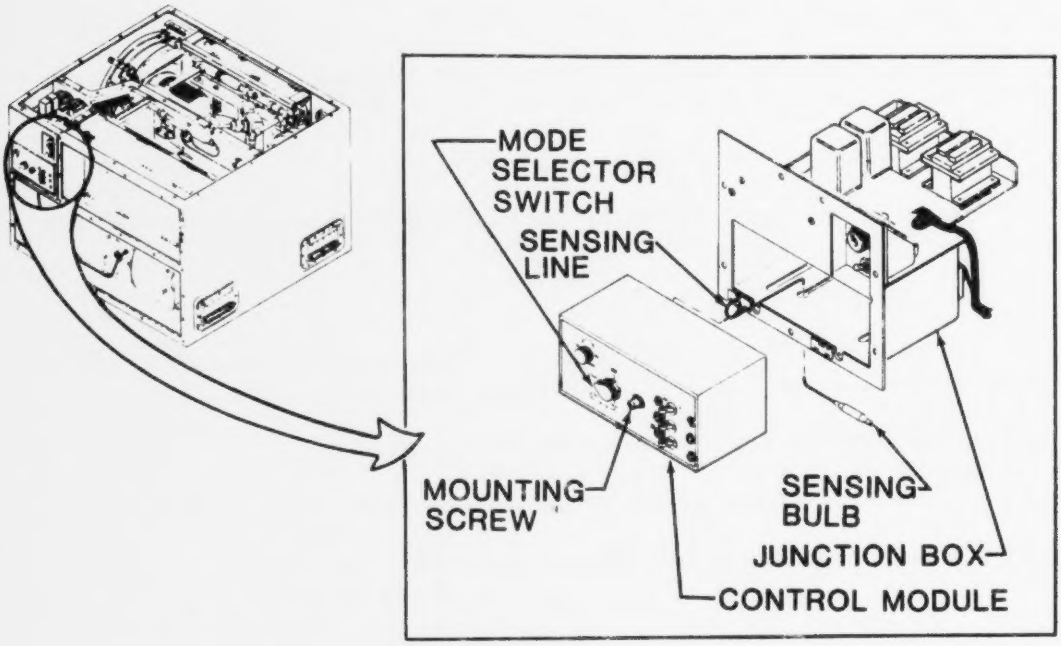

MODE SELECTOR SWITCH
SENSING LINE
MOUNTING SCREW
SENSING BULB
JUNCTION BOX
CONTROL MODULE

Figure 4-16. Control Module Removal

a. Removal.

(1) Disconnect power at power source.

(2) Remove eight screws and return air louver.

(3) Loosen sensing bulb attaching screw(s) and slip sensing bulb out of clamp(s).

(4) Loosen control module mounting screw and carefully pull control module out of unit. Use care to avoid damage to sensing line.

(5) Carefully work sensing bulb through the frame and out of unit.

4-21. CONTROL MODULE.-Continued

b. Test/Repair. (See fig. 4-17.)

(1) See paragraphs 4-22 through 4-25 for testing of individual components.

(2) Repairs are limited to replacement of individual components and repair of wire connections.

c. Replace. If the control module is damaged beyond repair, replace with a new control module.

d. Installation. (See fig. 4-16.)

(1) Carefully work sensing bulb through junction box frame and into mounting clamp(s) behind return air louver.

(2) Tighten clamp screw(s)

(3) Slip control module into the opening in junction box. Take care not to crush or kink sensing bulb capillary line.

(4) Tighten control module mounting screw.

(5) Install return air louver and secure with eight screws.

(6) Connect power at power source.

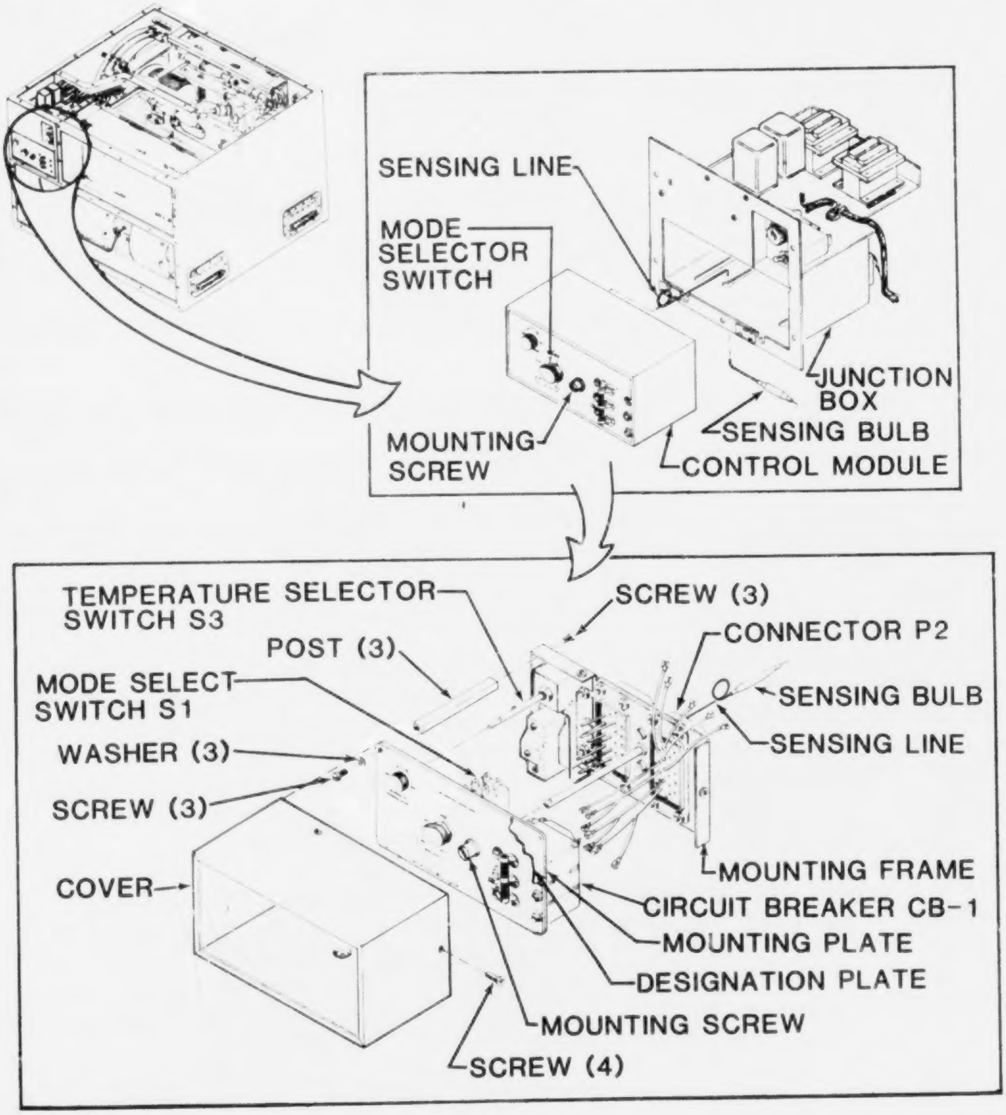

SENSING LINE
MODE SELECTOR SWITCH
JUNCTION BOX
SENSING BULB
MOUNTING SCREW
CONTROL MODULE
TEMPERATURE SELECTOR SWITCH S3
SCREW (3)
CONNECTOR P2
POST (3)
SENSING BULB
MODE SELECT SWITCH S1
SENSING LINE
WASHER (3)
SCREW (3)
MOUNTING FRAME
COVER
CIRCUIT BREAKER CB-1
MOUNTING PLATE
DESIGNATION PLATE
MOUNTING SCREW
SCREW (4)

Figure 4-17. Control Module

4-22. TEMPERATURE SELECTOR (CONTROL SWITCH THERMOSTAT) S3.

The TEMPERATURE SELECTOR (Control Switch Thermostat) S3 is located in the control module. (See fig. 4-18.)

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See para 4-21a and remove control module.

(3) See fig. 4-18 and remove four screws and pull cover off.

(4) Loosen setscrew in TEMPERATURE SELECTOR knob. Remove knob.

(5) Remove three screws from posts and slip mounting frame off.

(6) Tag and disconnect wires from TEMPERATURE SELECTOR.

(7) Remove four screws, washers, and nuts and pull TEMPERATURE SELECTOR from mounting frame.

b. Test.

(1) Place the sensing bulb in a container of warm water, 75° to 85°F (24° to 30°C) and set multimeter to measure resistance on RX1 scale. Place multimeter leads on terminals 1 and 3 of the thermostat (blue and red). Turn the knob to the extreme cooler position. There should be no indication of continuity on multimeter. Turn the knob to the extreme warmer position. Continuity should be indicated on the multimeter.

(2) Center or mid-range of the Temperature selector represents a setting of about 75°F (24°C). With the sensing bulb remaining in the container of warm water, 75° to 85°F (24° to 30°C), slowly turn the knob from the extreme warmer position towards the cooler position. Continuity should cease before or near mid-range of the knob.

c. Replace. Replace TEMPERATURE SELECTOR if defective.

d. Installation.

(1) Place TEMPERATURE SELECTOR on mounting frame and secure with four screws, washers and nuts.

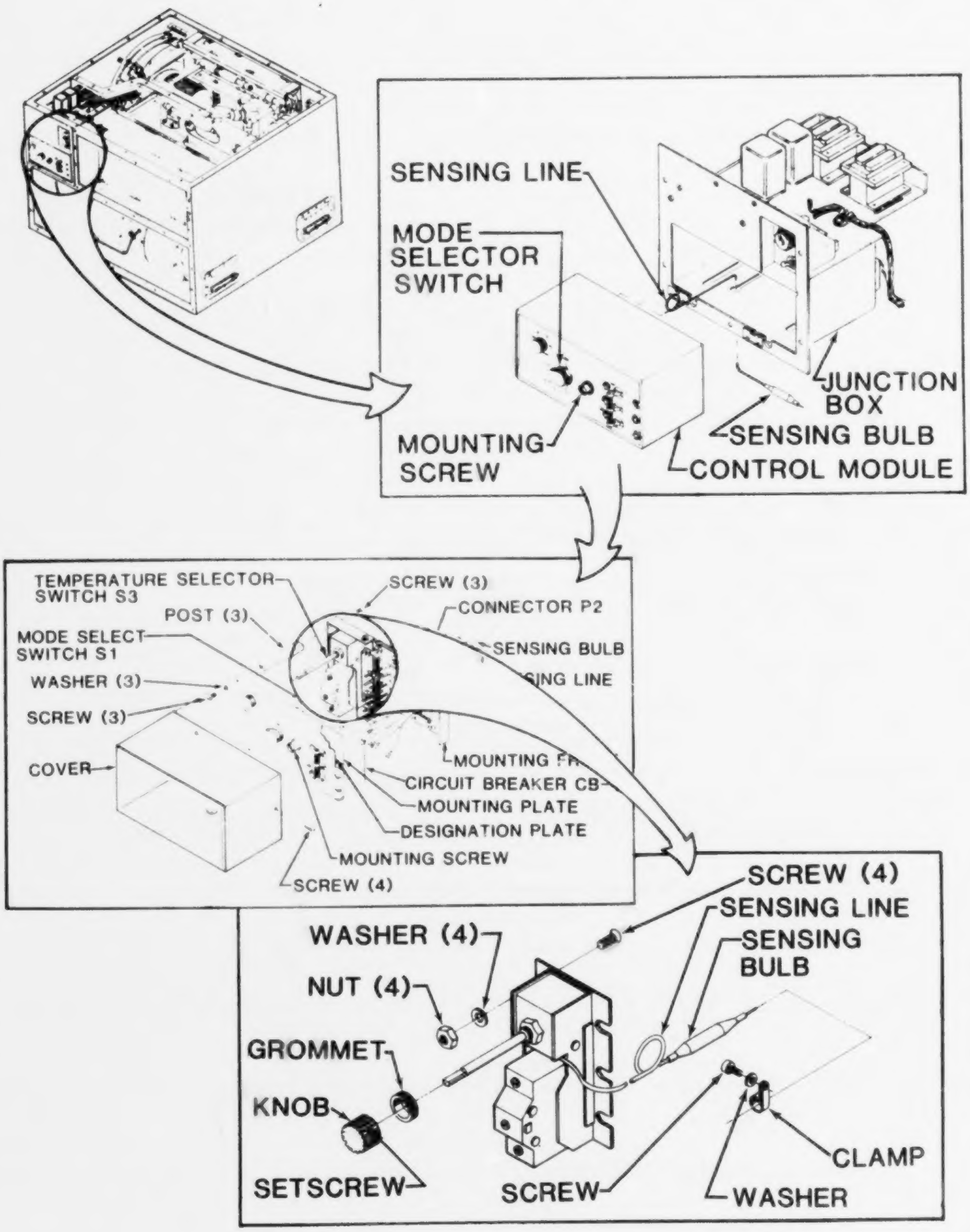

SENSING LINE
MODE SELECTOR SWITCH
JUNCTION BOX
SENSING BULB
MOUNTING SCREW
CONTROL MODULE
TEMPERATURE SELECTOR SWITCH S3
SCREW (3)
POST (3)
CONNECTOR P2
MODE SELECT SWITCH S1
SENSING BULB
WASHER (3)
SING LINE
SCREW (3)
COVER
MOUNTING FR
CIRCUIT BREAKER CB
MOUNTING PLATE
DESIGNATION PLATE
MOUNTING SCREW
SCREW (4)
SCREW (4)
SENSING LINE
WASHER (4)
SENSING BULB
NUT (4)
GROMMET
KNOB
CLAMP
SETSCREW
SCREW
WASHER

Figure 4-18. TEMPERATURE SELECTOR (Control Switch Thermostat) S3

4-22. TEMPERATURE SELECTOR (CONTROL SWITCH THERMOSTAT) S3.- Continued

(2) See wiring diagram figure 4-4 and tags and connect wire leads. Remove tags.

(3) Align holes in mounting frame with the three posts and secure with screws.

(4) Check that grommets are in place in shaft holes. Install TEMPERATURE SELECTOR knob and tighten setscrew.

(5) Slip cover in place and secure with four screws.

(6) See paragraph 4-21c and install control module.

(7) Connect power at power source.

4-23. MODE SELECTOR SWITCH S1.

The MODE SELECTOR switch S1 is the rotary type switch located in the control module. (See fig. 4-19.)

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) See figure 4-19 and remove four screws and pull cover off.

(4) Loosen setscrew in the TEMPERATURE SELECTOR knob. Remove knob.

(5) Remove the three screws from the posts and slip mounting frame off.

(6) Tag and disconnect wires from MODE SELECTOR switch.

(7) Loosen two setscrews and pull knob from MODE SELECTOR switch.

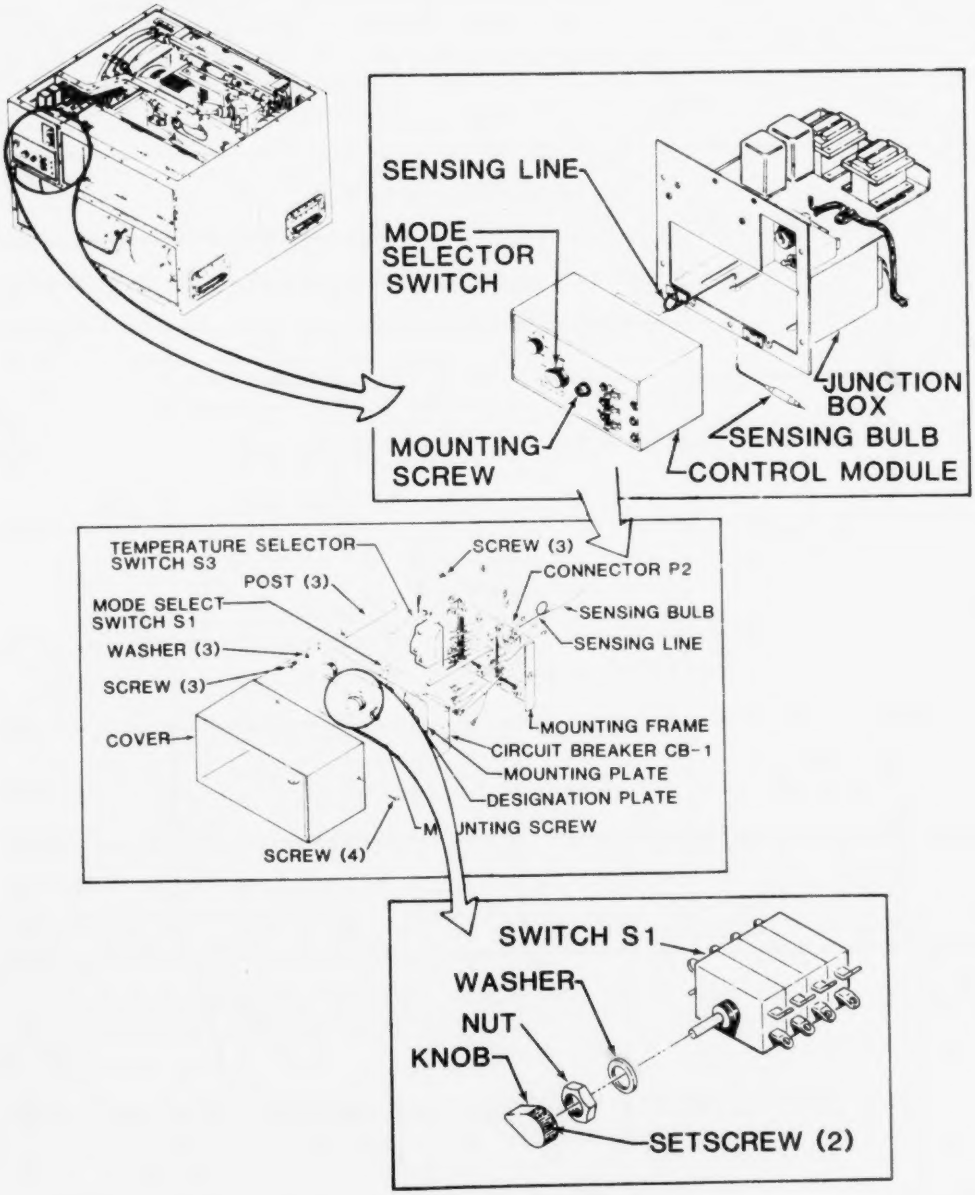

SENSING LINE
MODE SELECTOR SWITCH
JUNCTION BOX
SENSING BULB
MOUNTING SCREW
CONTROL MODULE
TEMPERATURE SELECTOR SWITCH S3
SCREW (3)
CONNECTOR P2
POST (3)
MODE SELECT SWITCH S1
SENSING BULB
SENSING LINE
WASHER (3)
SCREW (3)
COVER
MOUNTING FRAME
CIRCUIT BREAKER CB-1
MOUNTING PLATE
DESIGNATION PLATE
MOUNTING SCREW
SCREW (4)
SWITCH S1
WASHER
NUT
KNOB
SETSCREW (2)

Figure 4-19. MODE SELECTOR Switch S1

4-23. MODE SELECTOR SWITCH S1.-Continued

(8) Remove nut and washer and pull MODE SELECTOR switch from the panel.

b. Test. See the mode position chart below and check continuity at pins indicated to each of the positions indicated. Replace the switch if continuities are not in accordance with those indicated.

MODE POSITION CHART

Position	Function	Switch Section and Terminals Connected			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 and 1A	21 and 2C 22 and 2B	31 and 3C 32 and 3A	41 and 4C 42 and 4A
2	HEAT (LOW)	12 and 1A	21 and 2C 22 and 2B	31 and 3C	-
3	OFF	-	-	-	-
4	VENT	-	21 and 2C 22 and 2B	31 and 3C	-
5	COOL	12 and 1B 11 and 1D	21 and 2C 22 and 2B	32 and 3B 31 and 3C	41 and 4D 42 and 4B

c. Replace. Replace MODE SELECTOR switch if defective.

d. Installation. (See fig. 4-19.)

(1) Slip MODE SELECTOR switch shaft through panel hole and secure with mounting nut and washer supplied with switch.

(2) Place knob on MODE SELECTOR switch shaft and tighten setscrews.

4-23. MODE SELECTOR SWITCH S1.-Continued

(3) See wiring diagram figure 4-4 and tags and connect wire leads. Remove tags.

(4) Align holes in the mounting frame with the three posts and secure with screws.

(5) Check that grommets are in place in shaft holes. Install TEMPERATURE SELECTOR knob and tighten setscrew.

(6) Slip cover back in place and secure with four screws.

(7) See paragraph 4-21c and install control module.

(8) Connect power at power source.

4-24. COMPR CIRCUIT BKR CB1.

The COMPR CIRCUIT BKR is located in the control module.

a. Removal. (See fig. 4-20.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) See figure 4-20 and remove four screws and pull cover off.

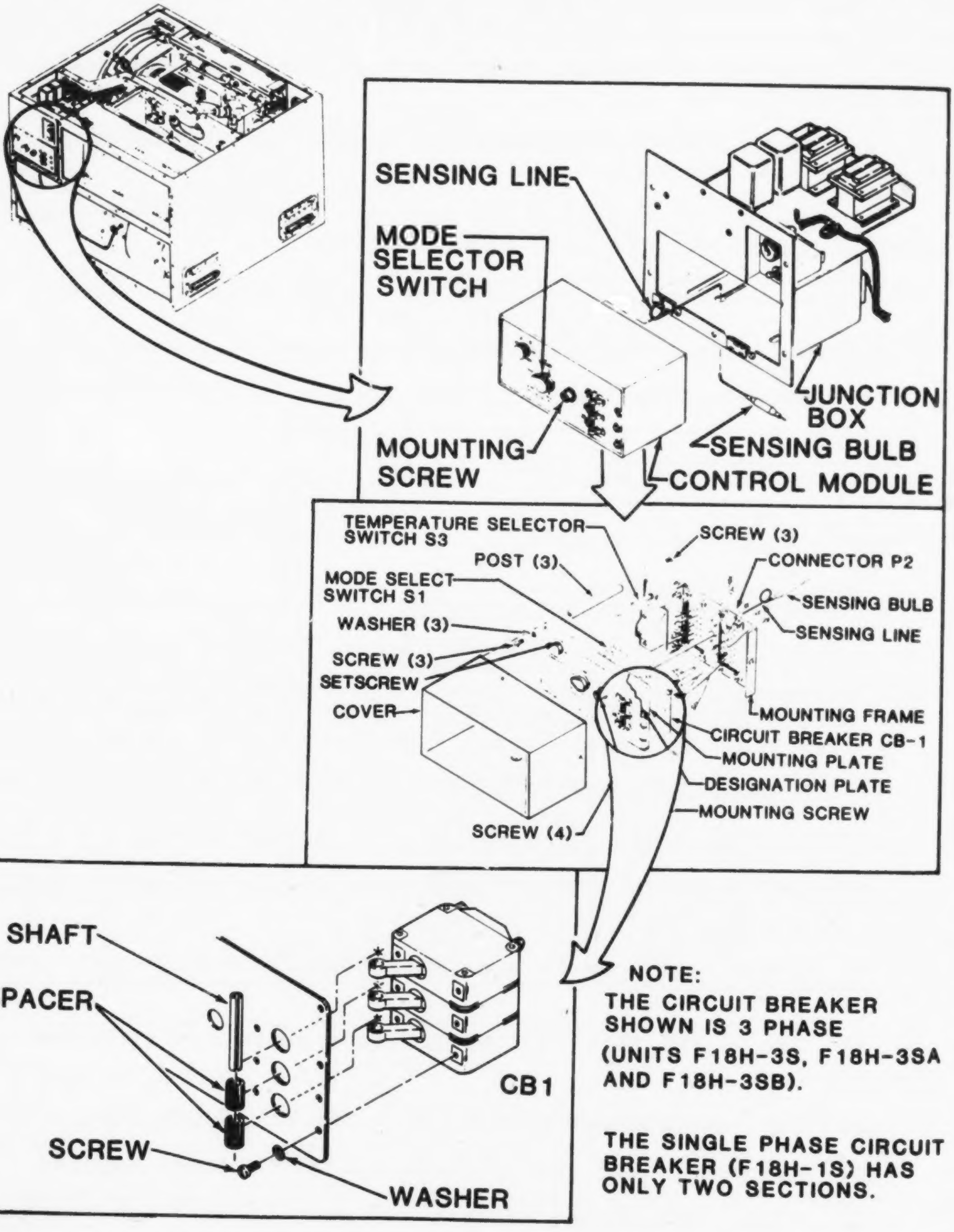
(4) Loosen setscrew in the TEMPERATURE SELECTOR knob. Remove knob.

(5) Remove the three screws from the posts and slip mounting frame off.

(6) Tag and disconnect wires from COMPR CIRCUIT BKR.

(7) Remove pin and spacers from circuit breaker toggles.

(8) Remove screws and washers and pull circuit breaker from the panel.


SENSING LINE
MODE SELECTOR SWITCH
JUNCTION BOX
SENSING BULB
MOUNTING SCREW
CONTROL MODULE
TEMPERATURE SELECTOR SWITCH S3
SCREW (3)
POST (3)
CONNECTOR P2
MODE SELECT SWITCH S1
SENSING BULB
WASHER (3)
SENSING LINE
SCREW (3)
SETSCREW
COVER
MOUNTING FRAME
CIRCUIT BREAKER CB-1
MOUNTING PLATE
DESIGNATION PLATE
MOUNTING SCREW
SCREW (4)
SHAFT
SPACER
SCREW
WASHER
CB1
*
*

NOTE:
THE CIRCUIT BREAKER SHOWN IS 3 PHASE (UNITS F18H-3S, F18H-3SA AND F18H-3SB).

THE SINGLE PHASE CIRCUIT BREAKER (F18H-1S) HAS ONLY TWO SECTIONS.

Figure 4-20. COMPR CIRCUIT BKR (Compressor Circuit Breaker) CB1

4-24. COMPR CIRCUIT BKR CB1.-Continued

b. Test.

(1) Check to see that continuity exists on each pair of terminals when circuit breaker is in the on position.

(2) Check to see that there is no continuity between terminals with circuit breaker in the off position.

c. Replace. Replace COMPR CIRCUIT BKR if defective.

d. Installation.

(1) Insert circuit breaker toggles through control panel. Be sure off position matches lettering on panel.

(2) Secure circuit breaker to panel with screws and washers.

(3) Insert pin and spacers through circuit breaker toggles to lock them together.

(4) See wiring diagram figure 4-4 and tags and connect wire leads. Remove tags.

(5) Align holes in the mounting frame with the three posts and secure with screws.

(6) Check that grommets are in place in shaft holes. Install TEMPERATURE SELECTOR knob and tighten setscrew.

(7) Slip cover back in place and secure with four screws.

(8) See paragraph 4-21c and install control module.

(9) Connect power at power source.

4-25. CONTROL MODULE WIRING HARNESS.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect. (See fig. 4-21.)

(1) Disconnect power at power source.

4-25. CONTROL MODULE WIRING HARNESS.-Continued

(2) See paragraph 4-21a and remove control module.

(3) See figure 4-21 and remove four screws and pull the cover off.

(4) Inspect connector for loose, damaged or missing pins. Replace if defective.

(5) Check individual wires for loose solder connections, loose terminal lugs, cut or frayed insulation, cut or broken wires.

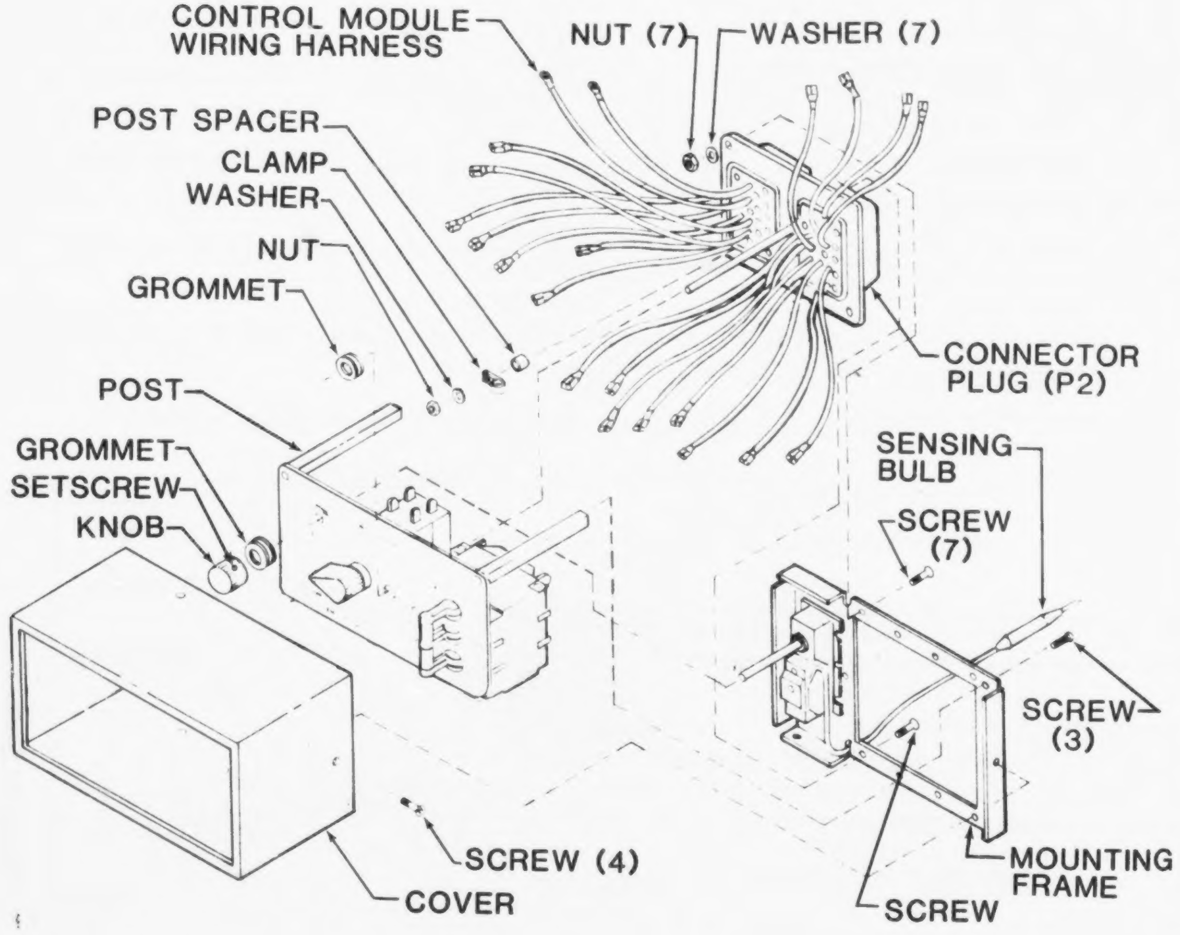

CONTROL MODULE WIRING HARNESS
NUT (7)
WASHER (7)
POST SPACER
CLAMP
WASHER
NUT
GROMMET
CONNECTOR PLUG (P2)
POST
GROMMET
SETSCREW
KNOB
SENSING BULB
SCREW (7)
SCREW (3)
SCREW (4)
COVER
MOUNTING FRAME
SCREW

Figure 4-21. Control Module Wiring Harness

4-25. CONTROL MODULE WIRING HARNESS.-Continued

b. Removal.

(1) Loosen setscrew in TEMPERATURE SELECTOR knob. Remove knob.

(2) Remove three screws from the posts and slip the mounting frame off.

(3) Tag and disconnect wires from components and ground stud.

(4) Remove attaching hardware and pull connector from mounting frame.

c. Testing. See the wiring diagram figure 4-4. Continuity test individual wires to corresponding pin in connector. Replace or repair wires with no continuity.

d. Repair.

(1) See paragraph 4-20 for general wire repair instructions.

(2) See table 4-3 Wire List for wire lengths and terminal information when individual wires are replaced.

e. Replace. Replace individual wires and terminals if defective.

f. Installation.

(1) Slip connector into mounting frame and secure with screws, nuts and washers.

(2) See the wiring diagram figure 4-4 and tags and connect wire leads. Remove tags.

(3) Align holes in mounting frame with three posts and secure with screws.

(4) Check that grommets are in place in shaft holes. Install TEMPERATURE SELECTOR knob and tighten setscrew.

(5) Slip cover back in place and secure with four screws.

(6) See paragraph 4-21c and install the control module.

(7) Connect power at power source.

4-26. JUNCTION BOX.

The junction box is located in the upper left front corner of the unit. (See fig. 4-22.)

a. Removal.

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) Remove top front cover on F18H-3S AND F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(4) Remove seven screws and lock washers and carefully slide junction box out of unit.

NOTE

Most maintenance, testing, and inspection of the junction box and individual components can be done at this stage. The junction box should be supported on a stand or table to avoid damage to wires or connections. If the complete junction box is to be replaced or removed proceed to step (5).

(5) Tag and disconnect individual wires and connectors of junction box harness from unit.

(6) Remove junction box.

b. Inspect.

(1) Inspect for missing or loose attaching hardware, damaged parts and excessive corrosion. Replace missing hardware and damaged parts. Tighten loose hardware and clean or repair parts as indicated.

(2) See paragraphs 4-27 through 4-29 for inspection/testing of wiring harness and individual components.

c. Replace. If the junction box is damaged beyond repair, replace with a new junction box.

d. Installation.

(1) If wiring harness was disconnected from unit, see the wiring diagram figure 4-4 and tags and connect wire leads and connectors. Remove tags.

(2) Carefully slide junction box into place and secure with seven screws and lock washers.

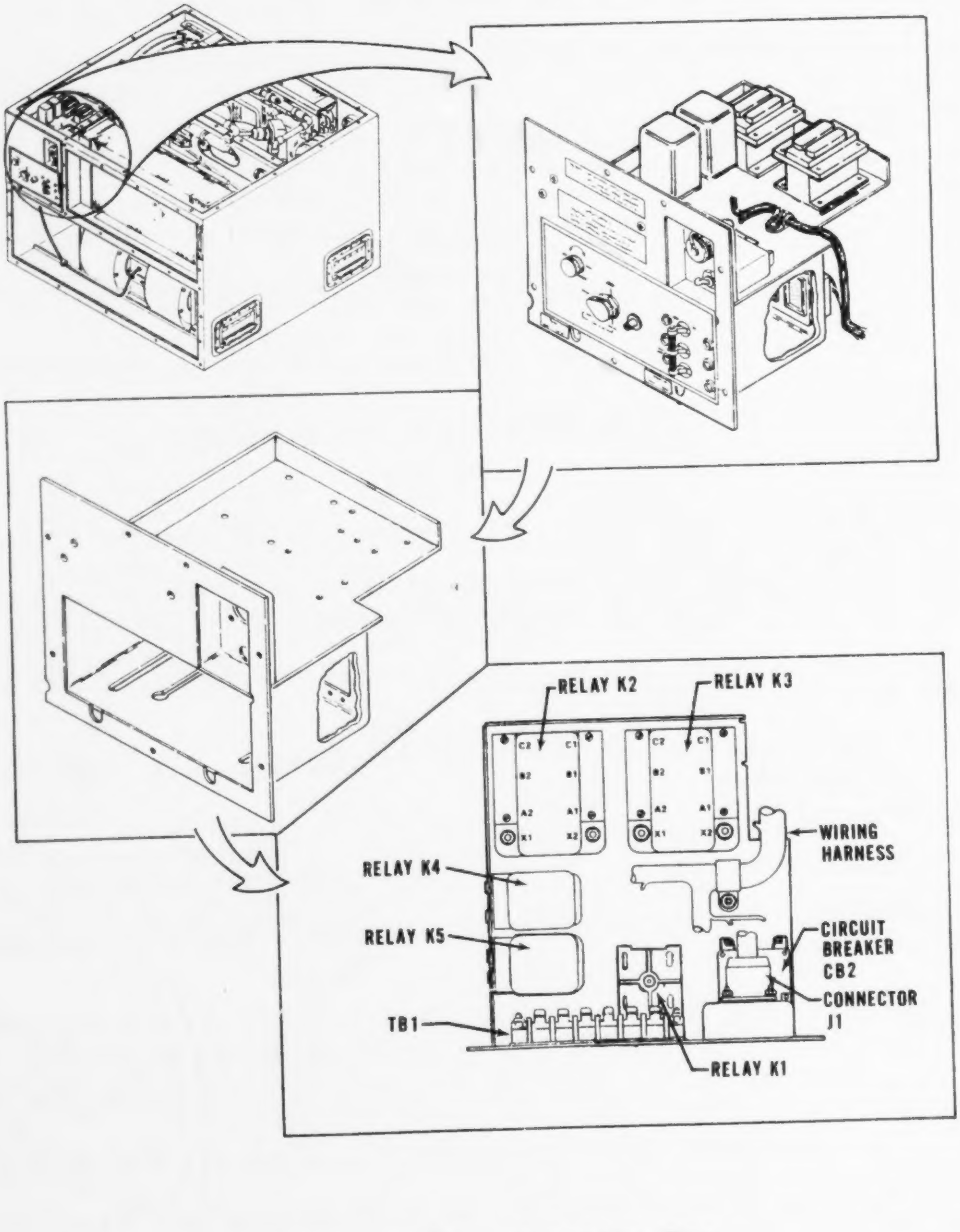

RELAY K2
RELAY K3
WIRING HARNESS
RELAY K4
RELAY K5
CIRCUIT BREAKER CB2
CONNECTOR J1
TB1
RELAY K1

Figure 4-22. Junction Box

4-26. JUNCTION BOX.-Continued

(3) See paragraph 4-21c and install control module.

(4) Install top front cover on F18H-3S and F18H-1S or top cover on F18H-S3A and F18H-3SB (para 4-11).

(5) Connect power at power source.

4-27. JUNCTION BOX WIRING HARNESS.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect. (See fig. 4-23.)

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) Remove top front cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(4) Remove seven screws and lock washers and carefully slide junction box out of unit.

(5) Inspect connector for loose, damaged or missing pins. Replace if defective.

(6) Check individual wires for loose solder connections, loose terminal lugs, cut or frayed insulation, cut or broken wires.

b. Removal. Tag and disconnect individual wires and connectors from unit. (See fig. 4-23.)

c. Testing. See wiring diagram figure 4-4. Continuity test individual wires. Replace or repair wires with no continuity.

d. Repair.

(1) See paragraph 4-20 for general wire repair instructions.

(2) See table 4-3 Wire List for wire lengths and terminal information when individual wires are replaced.

e. Replace. Replace individual wires, terminals or connectors if defective.

4-27. JUNCTION BOX WIRING HARNESS.-Continued

f. Installation.

(1) See wiring diagram figure 4-4 and tags and connect the wire leads and connectors. Remove tags.

(2) Carefully slide junction box into place and secure with seven screws and lock washers.

(3) See paragraph 4-21c and install control module.

(4) Install top front cover on Models F18H-3S and F18H-1S or top cover on Models F18H-3SA and F18H-3SB (para 4-11).

(5) Connect power at power source.

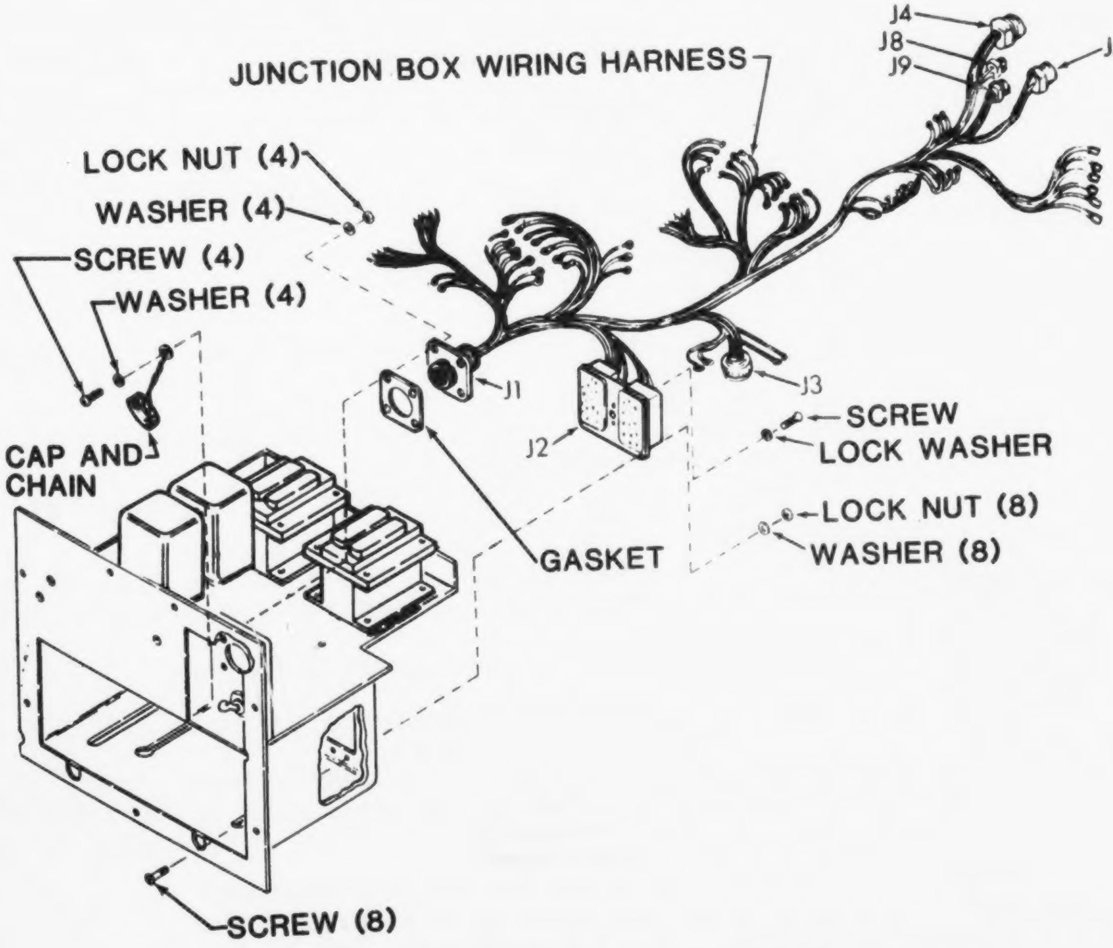

J4
J8
J9
J5
JUNCTION BOX WIRING HARNESS
LOCK NUT (4)
WASHER (4)
SCREW (4)
WASHER (4)
CAP AND CHAIN
J1
J2
J3
SCREW
LOCK WASHER
LOCK NUT (8)
WASHER (8)
GASKET
SCREW (8)

Figure 4-23. Junction Box Wiring Harness

4-28. RELAYS.

Relays K2, K3, K4 and K5 and time delay relay K1 are located in the junction box. (See fig. 4-24.)

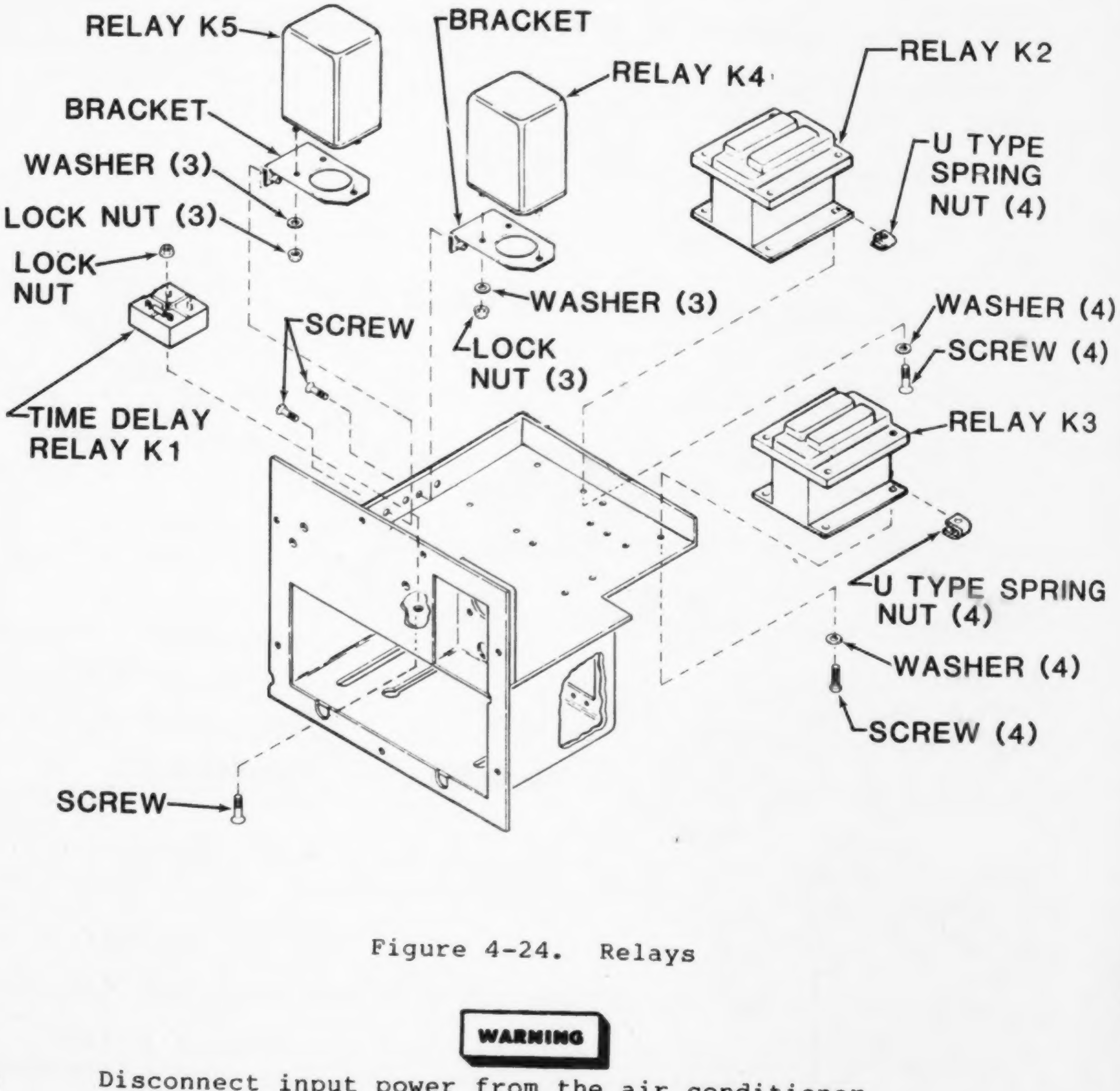

RELAY K5
BRACKET
RELAY K4
RELAY K2
BRACKET
WASHER (3)
LOCK NUT (3)
U TYPE SPRING NUT (4)
LOCK NUT
WASHER (3)
SCREW
LOCK NUT (3)
WASHER (4)
SCREW (4)
TIME DELAY RELAY K1
RELAY K3
U TYPE SPRING NUT (4)
WASHER (4)
SCREW (4)
SCREW

Figure 4-24. Relays

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

4-28. RELAYS.-Continued

a. Test.

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) Remove top front cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(4) Remove seven screws and lock washers and carefully slide junction box out of unit.

(5) Relays K2 and K3.

(a) Apply 28VDC to terminals X1 and X2; X1 is positive, X2 is negative.

(b) Check continuity across terminals A1 and A2; B1 and B2, and C1 and C2. The multimeter must show that contacts are closed.

(c) Remove power. Multimeter must show that contacts are open.

(6) Relays K4 and K5.

(a) Apply 28VDC to terminals 2 and 9; 2 is positive, 9 is negative.

(b) Check continuity across terminals, 1 and 3; 5 and 11; and 10 and 8.

(c) Read Multimeter. It should indicate that terminals 1 and 3, 5 and 11, and 10 and 8 are closed. Terminals 1 and 4, 5 and 6, and 10 and 7 are open.

(d) Remove 28VDC power. Multimeter should indicate that terminals 1 and 4, 5 and 6, and 10 and 7 are closed and that terminals 1 and 3, 5 and 11, and 10 and 8 are open.

(7) Time delay relay K1.

(a) Connect multimeter to terminal A1 and A2 of relay K3.

(b) Apply +28VDC to terminal 2 of K1 and 28VDC ground to terminal X2 of K3. Terminal 2 of K1 is positive and terminal X2 of K3 is negative.

4-28. RELAYS.-Continued

(c) Multimeter must show continuity across terminals A1 and A2 of relay K3 within 30 ± 3 seconds after applying the 28 VDC.

(d) Remove the 28VDC. The multimeter must show that contacts are open.

b. Removal.

(1) Tag and disconnect wires to relay.

(2) See figure 4-24 and remove attaching hardware.

(3) Pull relay from junction box.

c. Replace. Replace individual relays if defective.

d. Installation.

(1) Mount relay using hardware indicated on figure 4-24.

(2) See figure 4-4 wiring diagram and tags and connect leads. If relay has solder connections be sure to protect solder joints with heat shrink or equal insulation tubing.

(3) Carefully slide junction box into place and secure with seven screws and lock washers.

(4) See paragraph 4-21c and install control module.

(5) Install top front cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(6) Connect power at power source.

4-29. CONTROL CIRCUIT BREAKER CB2.

The CONTROL CIRCUIT BREAKER is located in the junction box. (See fig. 4-25.)

WARNING

> Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Test.

(1) Disconnect power at power source.

(2) See paragraph 4-21a and remove control module.

(3) Remove top front cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(4) Remove seven screws and lock washers and carefully slide junction box out of unit.

(5) Tag and disconnect leads.

(6) Check that there is continuity between the two terminals with the circuit breaker in the on position.

(7) Check that there is no continuity between terminals with the circuit breaker in the off position.

b. Removal.

(1) Remove attaching nut and hardware from front of panel.

(2) Slip circuit breaker from back of panel.

c. Replace. Replace CONTROL CIRCUIT BREAKER if defective.

d. Installation.

(1) Slip circuit breaker into hole in panel being sure that locating pin fits into hole in panel. Secure with nut and locking hardware provided with circuit breaker.

(2) See the wiring diagram figure 4-4 and tags and connect the wire leads. Remove tags.

(3) Carefully slide junction box into place and secure with seven screws and lock washers.

4-29. CONTROL CIRCUIT BREAKER CB2.-Continued

(4) See paragraph 4-21c and install control module.

(5) Install top front cover on F18H-3S and F18H-1S or top cover on F18H-3S and F18H-3SB (para 4-11).

(6) Connect power at power source.

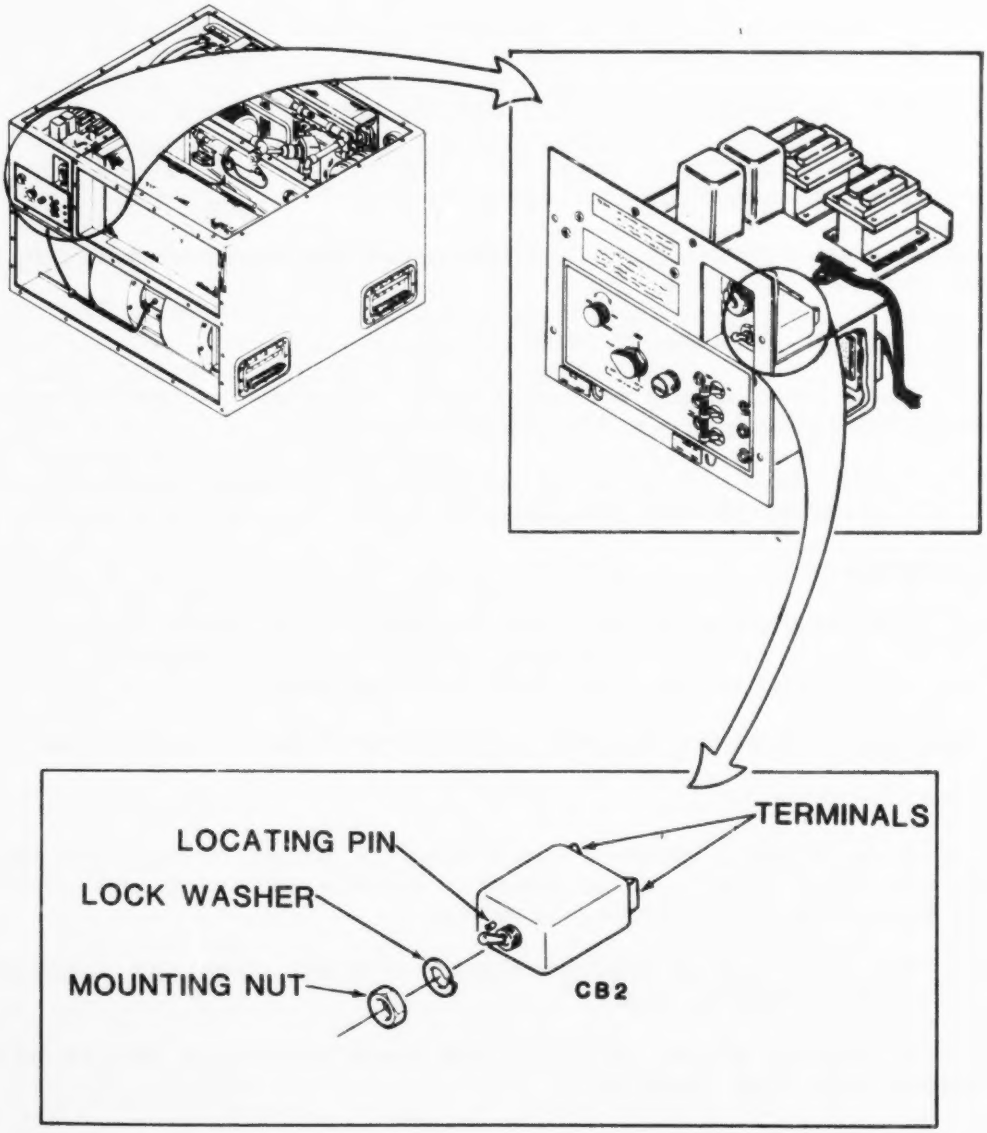

TERMINALS
LOCATING PIN
LOCK WASHER
MOUNTING NUT
CB2

Figure 4-25. Control Circuit Breaker CB2

4-30. MISCELLANEOUS CABLES, HARNESSES, AND TERMINAL BOARDS.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect/Test. (See fig. 4-26.)

(1) Disconnect power at power source.

(2) Remove top rear cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11) for access to compressor and auxiliary power input cables.

(3) For full access to terminal blocks TB2 and TB3 it is necessary to:

(a) Remove top front cover and top center cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(b) Remove junction box and control module (para 4-21 and 4-26).

(4) Check terminals on terminal boards that they are tight and free of corrosion.

(5) Disconnect connectors and check for loose, damaged, or missing pins.

(6) Check individual wires for loose solder connections, cut or frayed insulation and cut or broken wires.

(7) See wiring diagram (fig. 4-4) and continuity test individual wires. Repair or replace wires with no continuity.

b. Repair.

(1) See paragraph 4-20 for general wire repair instructions.

(2) See table 4-3 Wire List for wire lengths and terminal information when individual wires are replaced.

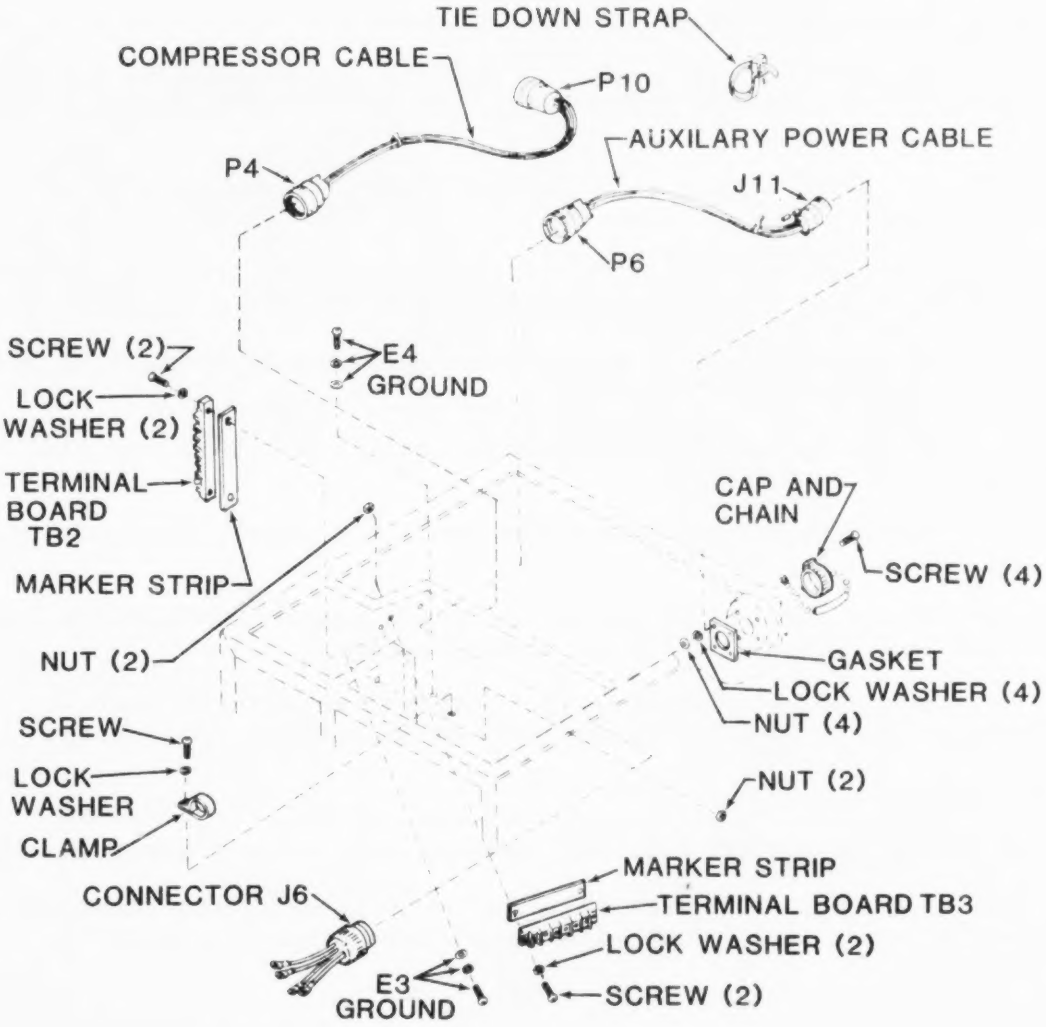

TIE DOWN STRAP
COMPRESSOR CABLE
P10
AUXILARY POWER CABLE
P4
J11
P6
SCREW (2)
E4
GROUND
LOCK WASHER (2)
TERMINAL BOARD TB2
CAP AND CHAIN
MARKER STRIP
SCREW (4)
NUT (2)
GASKET
LOCK WASHER (4)
NUT (4)
SCREW
LOCK WASHER
NUT (2)
CLAMP
MARKER STRIP
CONNECTOR J6
TERMINAL BOARD TB3
LOCK WASHER (2)
E3
GROUND
SCREW (2)

Figure 4-26. Miscellaneous Cables, Harnesses, and Terminal Boards

4-30. MISCELLANEOUS CABLES, HARNESSES, AND TERMINAL BOARDS.- Continued

c. Replace. Replace individual wires, connectors, or terminal boards if defective.

d. Installation.

(1) Connect all disconnected connectors.

(2) Install junction box and control module (para 4-21 and 4-26).

(3) Install top center, front, and rear covers on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(4) Connect power at power source.

4-31. TRANSFORMER, RECTIFIER, CAPACITORS, AND HARNESS.

NOTE

Designation C2 applies to models F18H-3S, F18H-3SA and F18H-3SB. This designation changes to C6 on model F18H-1S.

The transformer, rectifier, and capacitors C1 and C2 are located behind the junction box in the upper front left corner of the unit. (See fig. 4-27.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect.

(1) Disconnect power at the power source.

(2) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Remove junction box and control module (para 4-21 and 4-27).

(4) Check that solder connections and terminals are tight and in good condition.

(5) Check that harness wires have no cuts, broken wires, or frayed insulation.

(6) Check that attaching hardware is tight and in good condition.

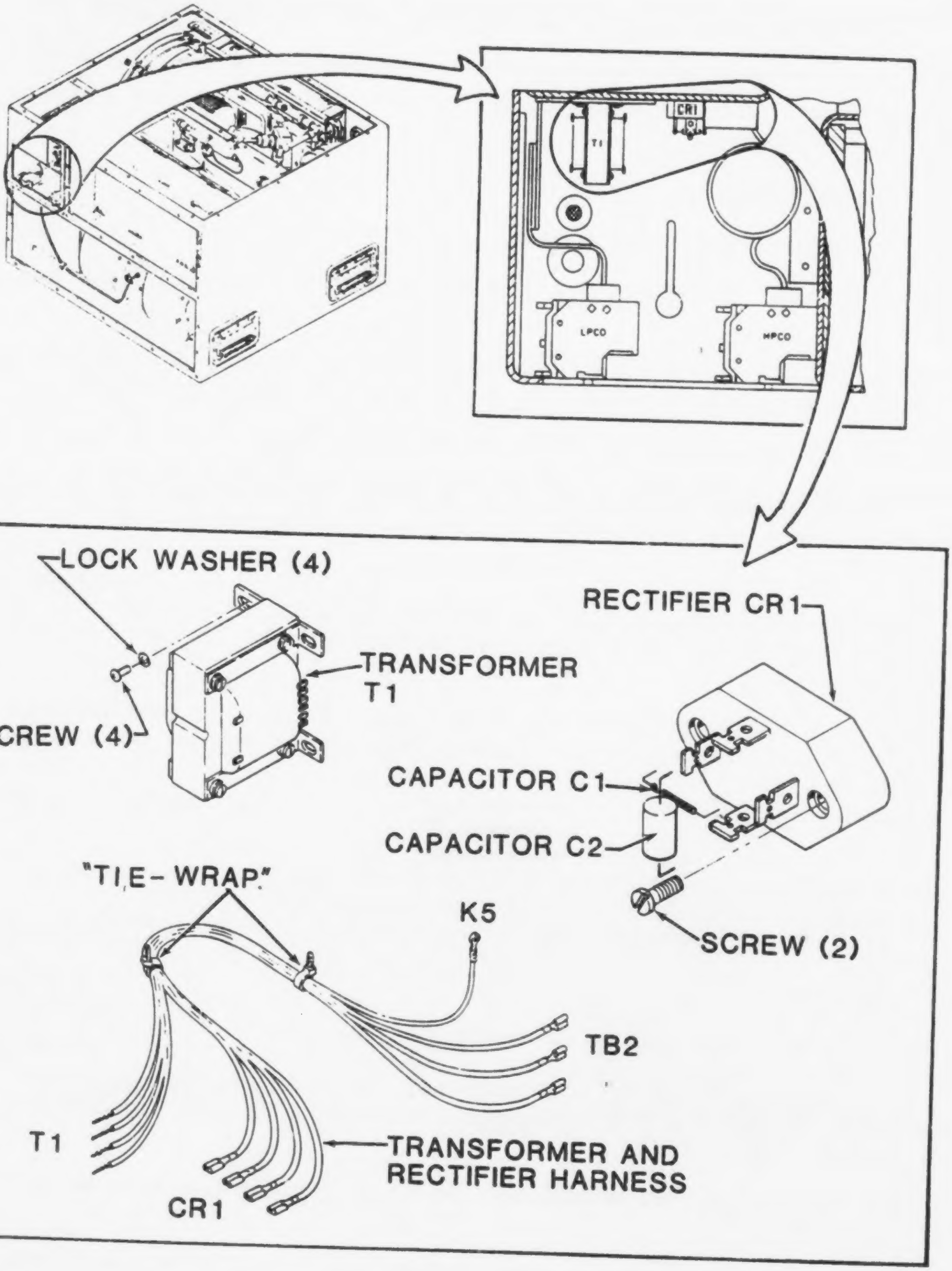

CR1
T1
LPCO
HPCO
LOCK WASHER (4)
RECTIFIER CR1
TRANSFORMER T1
SCREW (4)
CAPACITOR C1
CAPACITOR C2
"TIE-WRAP"
K5
SCREW (2)
TB2
T1
TRANSFORMER AND RECTIFIER HARNESS
CR1

Figure 4-27. Transformer and Rectifier

4-31. TRANSFORMER, RECTIFIER, CAPACITORS, AND HARNESS.-Continued

(7) Inspect electrical parts for obvious damage such as cracks, evidence of overheating, and broken terminals.

(8) Replace all damaged or broken parts.

b. Test.

(1) Transformer T1.

(a) Tag and disconnect leads. Do not remove jumper between pins 3 and 4 on transformer. Check for continuity across the primary winding pin 2 to pin 5 (on models F18H-3S, F18H-3SA and F18H-3SB) or access pins 1 and 6 on model F18H-1S and across the secondary winding pin 7 to pin 8. If either winding is open, replace transformer.

(b) Check for shorts between one terminal of each winding and transformer case and also between one primary terminal and one secondary terminal using an insulation tester, megger or multimeter on high ohms setting. Replace transformer if a short is indicated.

(c) (On models F18H-3S, F18H-3SA and F18H-3SB) Apply 208 volts AC to terminals 2 and 5 (input terminals). Voltage at transformer terminals 7 and 8 should be 27 to 33 volts AC. Remove power from transformer. Replace defective transformer.

(d) (On model F18H-1S) Apply 230 volts AC to terminals 1 and 6 (input terminals). Voltages at transformer terminals 7 and 8 should be 27 to 33 volts AC. Remove power from transformer. Replace defective transformer.

(2) Rectifier CR1.

(a) Tag and disconnect leads.

(b) Using a multimeter on high ohms setting connect negative (-) lead to terminal 2 and positive (+) lead to terminal 1 or 3. A low resistance reading should be obtained.

(c) Connect positive lead to terminal 2 and negative lead to terminal 1 or 3. A very high resistance or open circuit reading should be obtained.

(d) Connect positive lead to terminal 4 and negative lead to terminal 1 or 3. A low resistance reading should be obtained.

(e) Connect negative lead to terminal 4 and positive lead to terminal 1 or 3. A very high resistance or open circuit reading should be obtained.

(f) Replace defective rectifier.

4-31. TRANSFORMER, RECTIFIER, CAPACITORS, AND HARNESS.-Continued

NOTE

When rectifier CR1 is replaced capacitors C1 and C2 should also be replaced.

(3) Capacitors.

(a) Disconnect one lead of capacitor from circuit.

(b) Using an ohmmeter set to read high resistance, place the positive (+) probe on disconnected capacitor lead. Place negative (-) probe of ohmmeter on the other lead of capacitor while watching ohmmeter needle.

(c) The ohmmeter needle should move only very slightly or not at all. If needle moves quickly to top of the scale and remains there, capacitor contains a short circuit and must be replaced.

NOTE

The ohmmeter test does not show the behavior of a capacitor under load. Such testing requires special equipment which is not economically practical for testing small capacitors. If breakdown under load is suspected, replace the capacitor.

c. Replace.

(1) Transformer.

(a) Tag and disconnect wire leads.

(b) Remove four screws and lock washers and pull transformer from unit.

(c) Attach transformer to unit with four screws and lock washers.

(d) Slip heat shrinkable insulation tubing on ends of wires to be soldered.

(e) See wiring diagram figure 4-4 and tags and connect all wire leads. Remove tags.

(f) Slip heat shrink tubing over all exposed solder connections and shrink in place.

(2) Rectifier/Capacitors.

4-31. TRANSFORMER, RECTIFIER, CAPACITORS, AND HARNESS.-Continued

(a) Tag and disconnect wire leads.

(b) Remove two screws and pull rectifier from unit.

(c) Remove capacitors.

(d) Install capacitors.

(e) Attach rectifier to unit with two screws.

(f) See wiring diagram figure 4-4 and tags and connect all wire leads. Remove tags.

(3) Install junction box and control module. (See para 4-21 and 4-27.)

(4) (Models F18H-3S and F18H-1S) Install top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(5) Connect power at power source.

4-31.1.(MODEL F18H-1S ONLY)
CAPACITORS - CONDENSER RUN (C-2), EVAPORATOR RUN (C-3), COMPRESSOR START (C4), COMPRESSOR RUN (C-5) AND RELAY; COMPRESSOR START (K5).

Capacitors (C2, C3 and C5) are located behind the return air louver in the left corner. Capacitor C4 and relay K5 are located under the top cover and are mounted on the condenser side of the center bulkhead behind the control module and junction box.(See fig.4-27.1.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect.

(1) Disconnect power at power source.

(2) Remove top (front) cover (para 4-11).

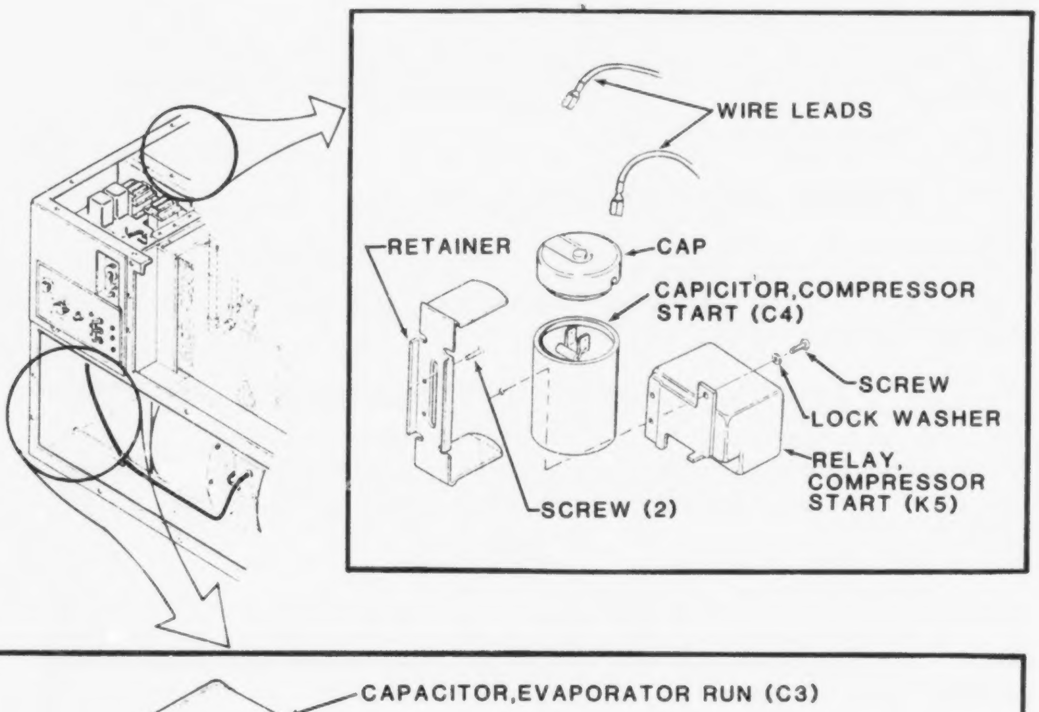

WIRE LEADS
RETAINER
CAP
CAPICITOR,COMPRESSOR START (C4)
SCREW
LOCK WASHER
RELAY, COMPRESSOR START (K5)
SCREW (2)
CAPACITOR,EVAPORATOR RUN (C3)
STRAP (2)
LOCK WASHER (4)
SCREW (4)
CAPACITOR,COMPRESSOR RUN (C5)
BOOT
CAPACITOR,CONDENSER RUN (C2)
LOCK WASHER (4)
SCREW (4)
BOOT
STRAP (2)
STRAP (2)
LOCK WASHER (4)
SCREW (4)

Figure 4-27.1 Capacitors and Relay, Model F18H-1S only

**4-31.1.(MODEL F18H-1S ONLY)
CAPACITORS - CONDENSER RUN (C-2), EVAPORATOR RUN (C-3), COMPRESSOR START (C4), COMPRESSOR RUN (C-5) AND RELAY; COMPRESSOR START (K5).
(Continued)**

(3) Remove return air louver (para 4-13).

WARNING

Ground all capacitors before touching. Touching the terminals of a charged capacitor can cause electrical shock and burns.

(4) Check that wire connections and terminals are tight and in good condition.

(5) Check that harness wires have no cuts, broken wires, or frayed insulation.

(6) Check that attaching hardware is tight and in good condition.

(7) Inspect electrical parts for obvious damage such as cracks, evidence of overheating, and broken terminals.

(8) Replace all damaged or broken parts.

b. Test Capactiors.

(1) Check by placing test leads of ohmmeter on capacitor terminals. Ohmmeter needle should move rapidly toward the top of the scale, then slowly return toward zero if the capacitor is good. If needle moves to top of scale and remains there indicating an internal short or if the needle does not move, indicating an open circuit, replace the capacitor.

(2) Check capacitors for short circuits to case by placing the positive (+) lead of the ohmmeter on the positive terminal of the capacitor and the negative (-) lead to the case. Continuity should not be indicated. Replace capacitor if bad.

c. Test Relay.

(1) Using a multimeter, check terminals 1-5, 2-5, and 1-2 for continuity.

(2) If continuity exists relay is good.

(3) If continuity is not indicated, replace relay.

4-31.1. CAPACITORS - CONDENSER RUN (C2), EVAPORATOR RUN (C3), COMPRESSOR START (C4), COMPRESSOR RUN (C5) AND RELAY; COMPRESSQR START (K5) APPLICABLE TO F18H-1S ONLY.

(Continued)

d. Capacitor (C2, C3 and C5) Removal.

(1) Remove protective boot.

(2) Tag and disconnect wire leads.

(3) Using screwdriver, remove four screws and lock washers and two straps from capacitor.

(4) Remove capacitor.

e. Capacitor (C4) Removal.

(1) Remove capacitor and cap from spring type retainer.

(2) Remove cap and tag and disconnect wire leads.

f. Relay (K5) Removal.

(1) Tag and disconnect wire leads.

(2) Using screwdriver, remove screw and pull relay away from bulkhead.

g. Install Capactiors (C2, C3, and C5).

(1) Position capacitors and straps.

(2) Using screwdriver, secure straps with two each screws and lock washers.

(3) Position protective boots on wires.

(4) See wiring diagram (figure 4-4) and tags and connect wire leads.

(5) Remove tags.

(6) Install protective boots.

h. Install Capactior (C4).

(1) See wiring diagram figure 4-4 and tags and connect wire leads.

(2) Remove tags.

4-31.1.(MODEL F18H-1S ONLY) CAPACITORS - CONDENSER RUN (C-2), EVAPORATOR RUN (C-3), COMPRESSOR START (C4), COMPRESSOR RUN (C-5) AND RELAY; COMPRESSOR START (K5). (Continued)

(3) Install cap.

(4) Secure capacitor and cap in spring retainer.

i. Install Relay.

(1) Align tab on rear of relay and position so that screw holes match.

(2) Using screwdriver install screw and lock washer.

(3) See wiring diagram figure 4-4 and tags and connect wire leads.

(4) Remove tags.

4-32. EVAPORATOR FAN, MOTOR, AND HOUSING.

The evaporator fan, motor, and housing are located behind the return air louver assembly. (See fig. 4-28.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect/Service.

(1) Disconnect power at power source.

(2) Remove return air louver assembly (para 4-13).

(3) Check that all parts are in place and in good condition.

(4) Inspect fans for damaged or bent blades and the motor for signs of overheating. Check all mounting hardware for tightness.

(5) Disconnect P3 motor connector plug and check for loose, damaged, or missing pins.

(6) Inspect fan housings for damage and missing or defective hardware.

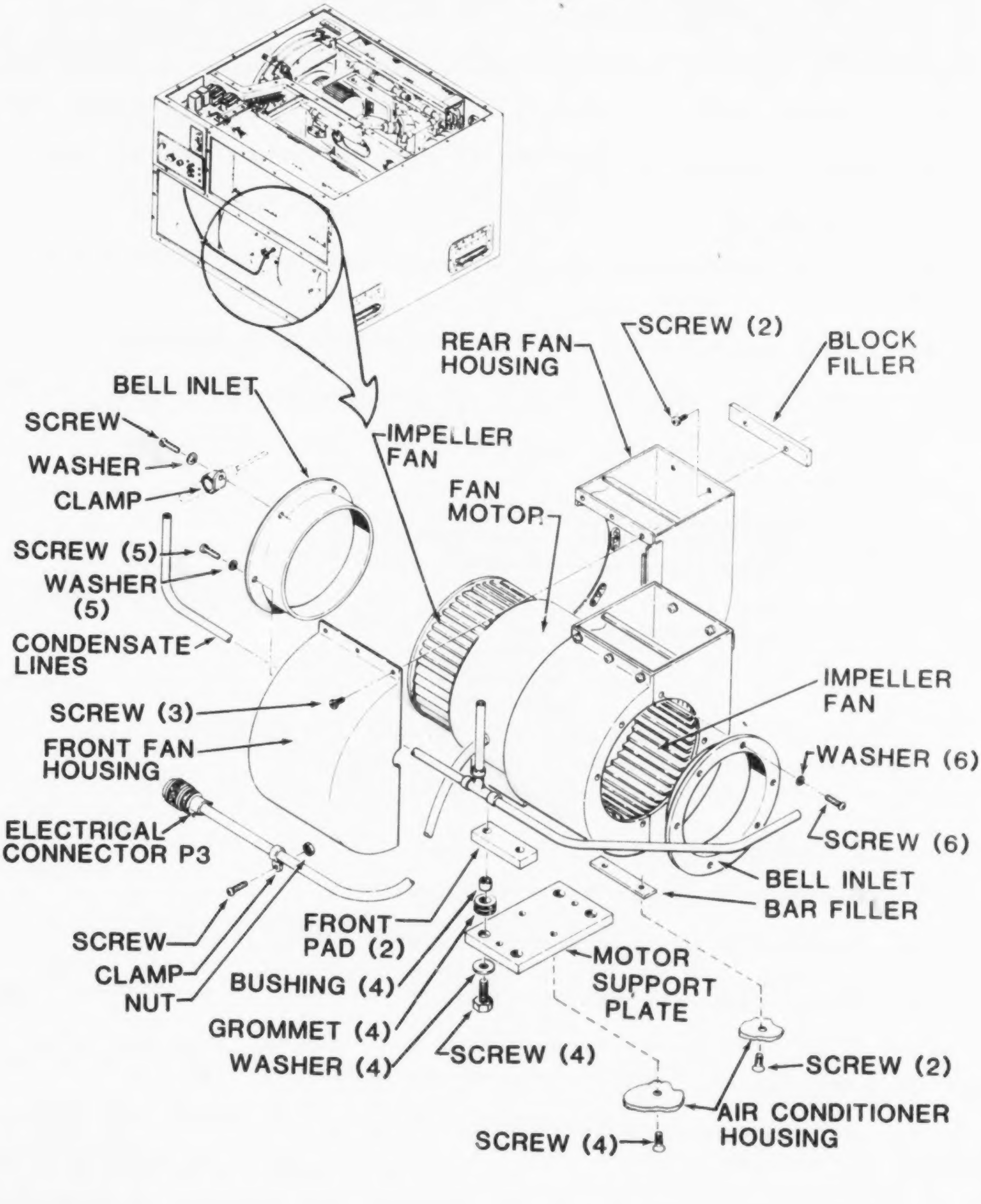

REAR FAN HOUSING
SCREW (2)
BLOCK FILLER
BELL INLET
SCREW
WASHER
CLAMP
IMPELLER FAN
FAN MOTOR
SCREW (5)
WASHER (5)
CONDENSATE LINES
SCREW (3)
FRONT FAN HOUSING
IMPELLER FAN
WASHER (6)
SCREW (6)
ELECTRICAL CONNECTOR P3
BELL INLET
BAR FILLER
SCREW
CLAMP
NUT
FRONT PAD (2)
BUSHING (4)
GROMMET (4)
WASHER (4)
MOTOR SUPPORT PLATE
SCREW (4)
SCREW (2)
AIR CONDITIONER HOUSING
SCREW (4)

Figure 4-28. Evaporator Fan, Motor, and Housing

4-32. EVAPORATOR FAN, MOTOR, AND HOUSING.-Continued

(7) Wipe or vacuum all dust or dirt from fans, motor, and housings.

(8) Repair of fan and housing is by replacement.

b. Test.

(1) Use an ohmmeter or continuity tester to check continuity between pins A and B and between A and C. Continuity should exist.

(2) Check continuity from pin G to pins A, B, C, D, and E. Continuity should not exist.

(3) Check continuity of thermal protectors between pins D and E. If continuity does not exist allow motor to cool and then recheck. If continuity still does not exist replace motor.

NOTE

If all the above inspections and tests are satisfactory, but the motor will still not operate properly, notify direct support maintenance, who may desire to make further tests before it is removed.

c. Removal/Disassembly.

(1) Disconnect power at power source.

(2) Remove eight screws, lockwashers, and return air louver assembly if not previously removed.

(3) Remove screw, self-locking nut, and loop clamp securing power cable.

(4) Disconnect connector P3.

(5) Remove screw, lockwasher, and loop clamp securing sensing bulb to bell inlet.

(6) Carefully move sensing bulb away from evaporator fan housing.

(7) Loosen two clamps and remove condensate lines from drip pan.

(7.1) On Model F18H-1S remove four screws and lock washers and move straps and capacitor C3 out of the way.

(8) Remove two screws and flat washers from front of left bell inlet.

4-32. EVAPORATOR FAN, MOTOR, AND HOUSING.-Continued

(9) Remove three screws and flat washers from front of right bell inlet.

(10) Remove six screws (three each side) from top of left and right front fan housings.

(11) Remove front fan housings by aligning slot with drain opening.

(12) Remove four screws and washers securing the motor to the housing. Screw heads are recessed in the bottom of the unit housing.

(13) Remove front pad.

CAUTION

Use caution in removing fans and motor assembly to avoid damage to fans.

(14) Remove motor and fan assembly and rear pad from unit.

(15) Remove four countersunk screws (located under unit) securing the left and right rear fan housings and bar fillers.

(16) Remove two bar fillers from under fan housings.

(17) Remove four screws and two block fillers from top of left and right rear fan housings. The block fillers are located between the housings and the unit wall.

(18) Position housings to allow access to the remaining six bell inlet screws and washers on right and left rear fan housings.

(19) Remove six screws and washers (three each side) from left and right bell inlets. Remove inlets.

(20) Remove left and right rear fan housings from unit.

(21) Loosen two set-screws located on fan hubs and remove fans from motor shaft.

d. Replace. Replace any defective components found during inspection and test.

e. Assembly/Installation.

(1) Mount impeller fans to motor shaft and secure with set screws located one on each hub.

4-32. EVAPORATOR FAN, MOTOR, AND HOUSING.-Continued

(2) Place left and right rear fan housings in unit.

(3) Position housings to allow installation of bell inlets.

(4) Install left and right bell inlets to rear fan housings and secure with six screws and washers (three each side).

(5) Secure rear fan housings and two block fillers with four screws through top of rear fan housings (two screws each side). The block fillers are placed between the rear fan housings and unit wall. Place the beveled edge toward the rear fan housing with the thickest part at the top.

(6) Place two bar fillers in position under left and right rear fan housing (between housings and floor of unit).

(7) Install four countersunk screws from under the unit to secure the left and right rear housings and bar fillers.

CAUTION

> Use caution in removing fans and motor assembly to avoid damage to fans.

(8) Position the rear pad over two rear holes on the motor support plate. Place the motor and fan assembly in place with the rear motor mounting holes aligned with the rear pad and holes.

(9) Insert the front pad between the motor support plate and motor front mounting holes and align.

(10) Install four screws and washers through the bottom of the unit housing to secure motor and fan assembly to housing.

(11) Place left and right front fan housings in position while aligning slots with drain openings.

(12) Secure left and right front fan housings to rear housings with six screws at top of housings (three each side).

(13) Secure right bell inlet to right front housing with three screws and flat washers.

(14) Secure left bell inlet to left front fan housing with two screws and flat washers.

(14.1) On model F18H-1S position capacitor C3 (Fig. 4-27.1) and mounting straps and secure with four screws and lock washers.

(15) Connect condensate drain lines and secure with two clamps.

4-32. EVAPORATOR FAN, MOTOR, AND HOUSING.-Continued

(16) Carefully position sensing line and bulb in position over left bell inlet.

(17) Secure sensing line and bulb in position on bell inlet with loop clamp, screw, and lock washer.

(18) Connect P3 and hand tighten.

(19) Secure power cable to housing with loop clamp, screw, and self-locking nut.

(20) Install return air louver assembly and secure with eight screws and lock washers.

(21) Connect power at power source.

4-33. HEATER THERMOSTAT.

The heater thermostat S6 mounts on the forward inside surface of the top center cover on models F18H-3S and F18H-1S and on the evaporator angle on models F18H-3SA and F18H-3SB. (See fig. 4-29.)

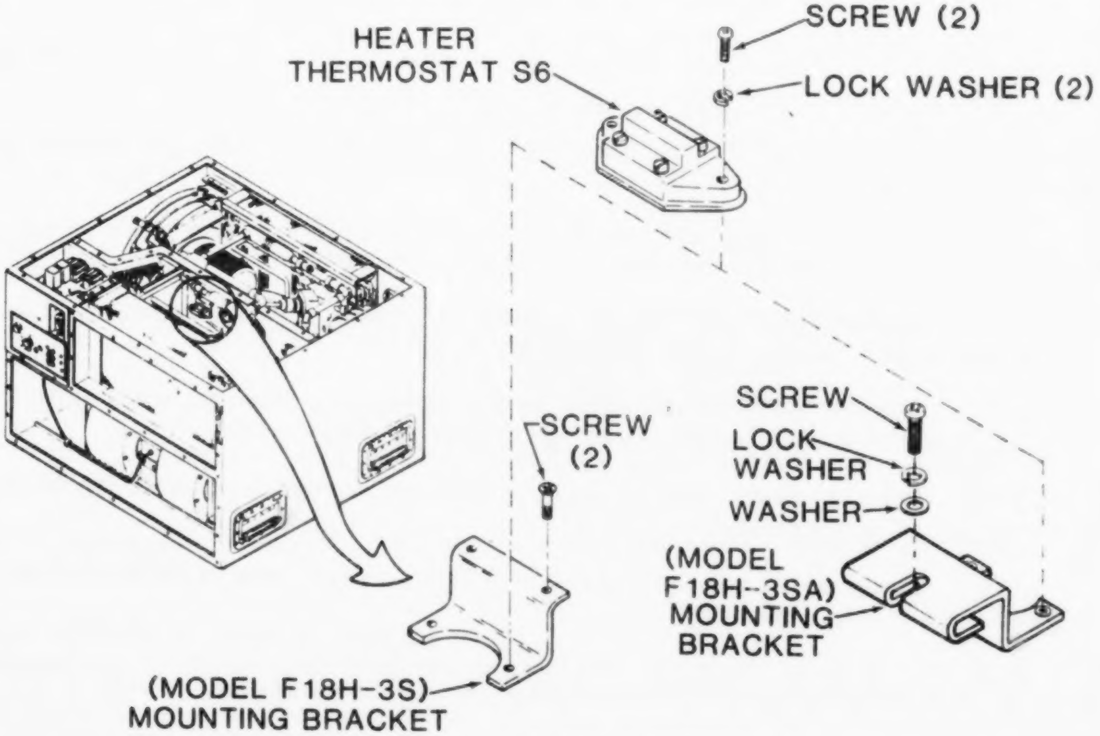

HEATER THERMOSTAT S6
SCREW (2)
LOCK WASHER (2)
SCREW
LOCK WASHER
WASHER
SCREW (2)
(MODEL F18H-3SA) MOUNTING BRACKET
(MODEL F18H-3S) MOUNTING BRACKET

Figure 4-29. Heater Thermostat

4-33. HEATER THERMOSTAT.-Continued

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect/Test.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) (Models F18H-3S and F18H-1S only) Remove two screws and lock washers that attach heater thermostat bracket to top center cover.

(4) Inspect for cracks, loose connections, and obvious damage. Replace if defective.

(5) Tag and disconnect leads.

(6) Using a multimeter check continuity on terminals 1 and 2 of the thermostat. Continuity should be indicated.

(7) Repeat step (6) with meter connected to terminals 3 and 4.

(8) Tape the bulb of a thermometer or junction of a thermocouple to the body of the heater thermostat, and connect the multimeter to terminals 1 and 2. Use a 150 watt lamp bulb or a heat source. Gradually apply heat while observing both the thermometer and the multimeter. Continuity should drop out at 145 to 155°F (63 to 68°C). Remove heat source and let the thermostat cool while observing the thermostat and multimeter. Continuity should be re-established at 100 to 120°F (38 to 49°C).

(9) Repeat step (8) with meter connected to terminals 3 and 4.

b. Replace. Replace defective heater thermostat by removing two screws and lock washers that attach thermostat to bracket.

c. Installation.

(1) See tags and wiring diagram figure 4-4 and connect leads. Remove tags.

(2) Attach thermostat to bracket with two screws and lock washers.

4-33. HEATER THERMOSTAT.-Continued

(3) (Models F18H-3S and F18H-1S only) Attach thermostat and bracket to top center cover with two screws.

(4) Install top front cover on F18H-3S and F18H-1S or top cover on F18H-3SA and F18H-3SB (para 4-11).

(5) Connect power at power source.

4-34. HEATER ELEMENTS.

The heater elements are located in the upper front compartment behind the evaporator coil. (See fig. 4-30.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

WARNING

Allow heaters to cool before touching. Severe burns can result from touching hot heaters.

a. Inspect/Test.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) To gain access to terminal board TB2 where heater element leads are connected the junction box and control module must also be removed. (See para 4-21 and 4-26.)

(4) Visually inspect each heater for obvious damage, deformation, cracked or broken sheath, burnt out spots, and loose, broken, or otherwise damaged leads.

(5) Use a multimeter to check continuity of each heating element. Continuity should be indicated.

b. Removal.

(1) Tag and disconnect leads from terminal board TB2.

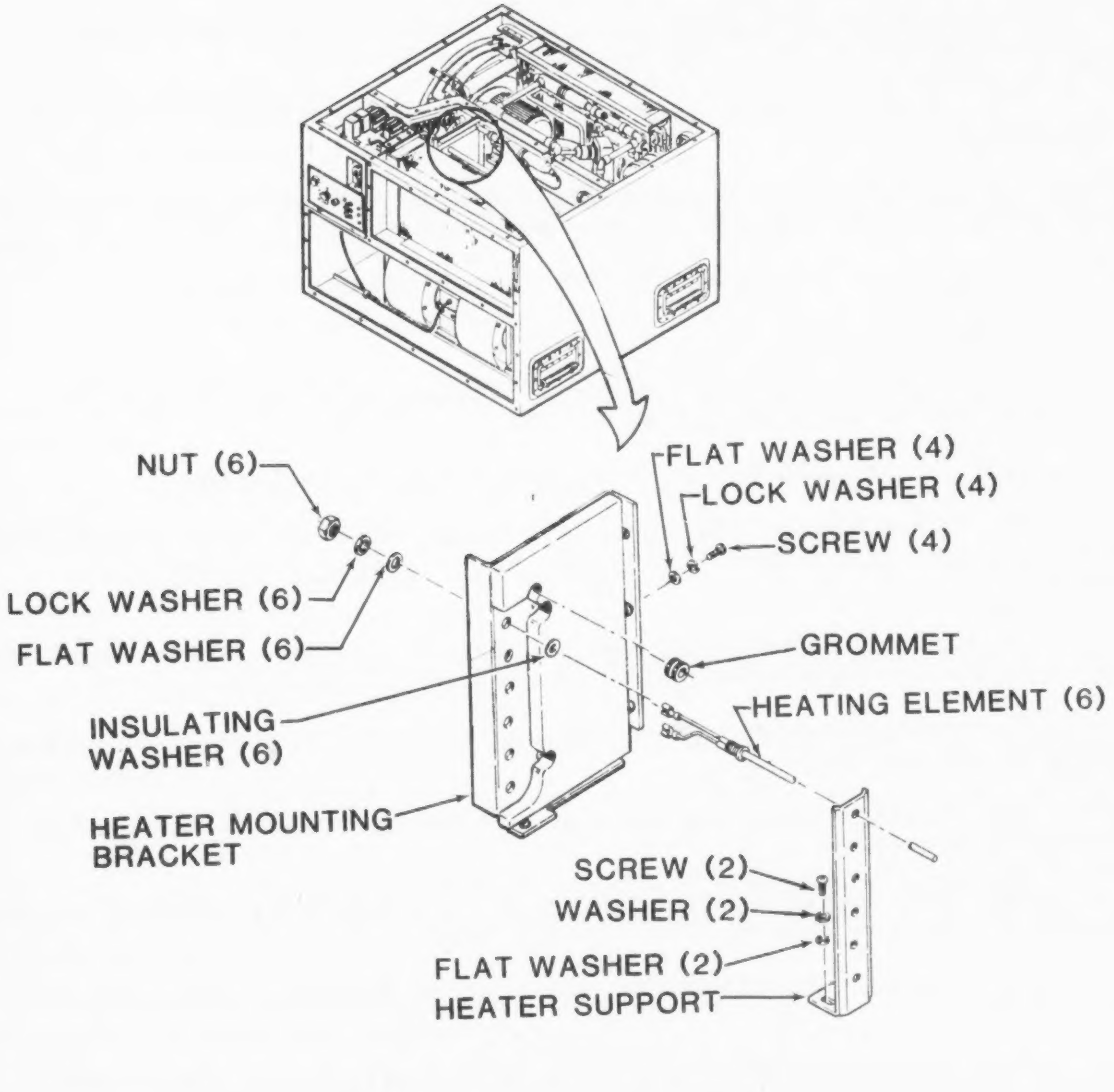

NUT (6)
LOCK WASHER (6)
FLAT WASHER (6)
INSULATING WASHER (6)
HEATER MOUNTING BRACKET
FLAT WASHER (4)
LOCK WASHER (4)
SCREW (4)
GROMMET
HEATING ELEMENT (6)
SCREW (2)
WASHER (2)
FLAT WASHER (2)
HEATER SUPPORT

Figure 4-30. Heater Elements

4-34. HEATER ELEMENTS.-Continued

(2) Remove two screws, lock washers, and flat washers and remove heater support.

(3) Remove attaching hardware from heater mounting bracket.

(4) Slip bracket up enough to gain access to top heater.

(5) Remove retaining nut, lock washer, flat washer, and insulating washer and slip heater out of bracket.

(6) Remove remaining heaters using same methods as (4) and (5) above.

c. Cleaning. Use a clean dry cloth to wipe dust and dirt from heaters. Do not use solvent or detergent.

d. Replace. Replace any defective heating elements.

e. Installation.

(1) Position heater mounting bracket into top of unit so heaters can be mounted one at a time.

(2) Start with bottom most heater to be installed.

(3) Slip heater through the bracket hole and secure with nut, lock washer, flat washer, and insulating washer provided with heater.

(4) Install remaining heaters one at a time. Slide mounting bracket down progressively as each heater is installed.

(5) Place heater support in the unit and slip ends of heaters through support holes.

(6) Install mounting hardware in heater support and heater mounting bracket.

(7) See tags and wiring diagram figure 4-4 and connect heater leads at terminal board TB2. Remove tags.

(8) Install junction box and control module. (See para 4-21 and 4-26.)

(9) (Models F18H-3S and F18H-1S) Install three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(10) Connect power at power source.

4-35. CONDENSER FAN, MOTOR, AND HOUSING.

The condenser fan, motor, and housing are located in the rear of condenser section of the unit. (See fig. 4-31.)

WARNING

> Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Inspect/Service.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Check that all parts are in place and in good condition.

(4) Inspect impeller fan for damaged or bent blades and the motor for signs of overheating. Check all mounting hardware for tightness.

(5) Disconnect P5 motor connector plug and check for loose, damaged, or missing pins.

(6) Inspect condenser fan housing for damage and for missing or defective hardware.

(7) Wipe or vacuum all dust or dirt from impeller fan, condenser fan housing, and motor.

(8) Repair of impeller fan and condenser fan housing is by replacement.

b. Test.

(1) Use a continuity tester to check continuity of field coils between pins A and B and between pins A and C. Continuity should exist.

(2) Check continuity from pin G to pins A, B, C, D, and E. Continuity should not exist.

(3) Check continuity of thermal protectors between pins D and E. If continuity does not exist allow motor to cool and then recheck. If continuity still does not exist replace motor.

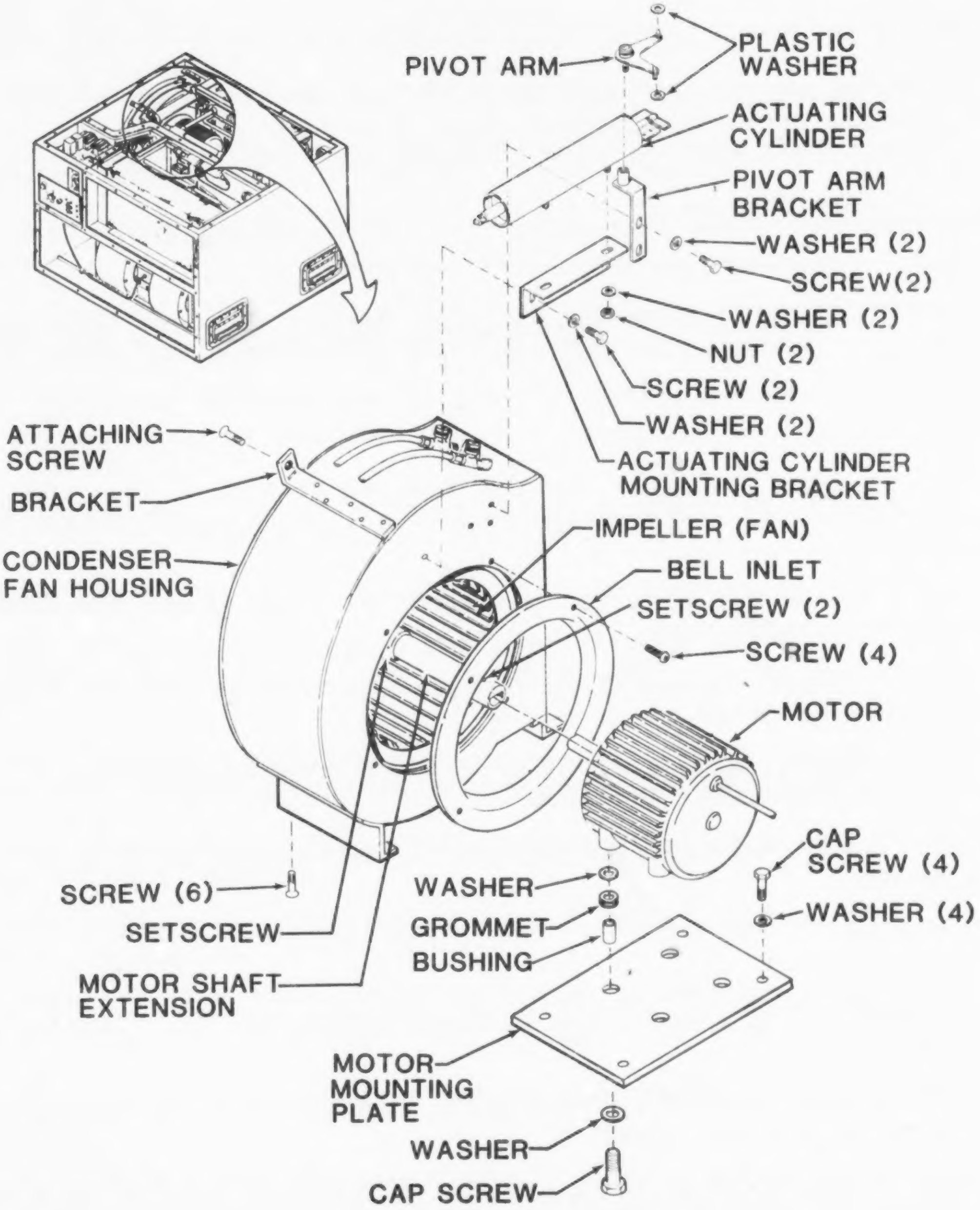

PLASTIC WASHER
PIVOT ARM
ACTUATING CYLINDER
PIVOT ARM BRACKET
WASHER (2)
SCREW(2)
WASHER (2)
NUT (2)
SCREW (2)
WASHER (2)
ACTUATING CYLINDER MOUNTING BRACKET
ATTACHING SCREW
BRACKET
CONDENSER FAN HOUSING
IMPELLER (FAN)
BELL INLET
SETSCREW (2)
SCREW (4)
MOTOR
CAP SCREW (4)
WASHER (4)
SCREW (6)
WASHER
GROMMET
BUSHING
SETSCREW
MOTOR SHAFT EXTENSION
MOTOR MOUNTING PLATE
WASHER
CAP SCREW

Figure 4-31. Condenser Fan, Motor, and Housing

4-35. CONDENSER FAN, MOTOR, AND HOUSING.-Continued

NOTE

If all the above inspections and tests are satisfactory, but the motor will still not operate properly, notify direct support maintenance, who may desire to make further tests before it is removed.

c. Removal/Disassembly.

(1) Cut tie strap securing wiring harnesses to refrigeration tube.

(2) Disconnect connectors P4, P5, P6, P8, and P9.

(3) Remove two screws and washers from pivot arm mounting bracket.

(4) Remove pivot arm bracket and pivot arm along with two plastic washers.

CAUTION

Support actuating cylinder using a tie strap to prevent damage to refrigeration system and accidental breaking of tubes.

(5) Remove two nuts and washers securing actuating cylinder to mounting bracket.

(6) Remove two screws, washers, and actuating cylinder mounting bracket from condenser fan housing.

(7) Loosen setscrews from motor shaft extension at motor end.

(8) Remove four screws and washers from top of motor mounting plate.

(9) Carefully lift motor and mounting plate up and out of unit.

(10) Remove motor shaft extension by loosening setscrew on fan hub.

(11) If motor is to be repaired or replaced remove it from mounting plate by removing four cap screws and hardware.

(12) Refer motor repairs to direct support maintenance.

4-35. CONDENSER FAN, MOTOR, AND HOUSING.-Continued

NOTE

The impeller fan and condenser fan housing must be removed together as follows.

(13) Remove four screws and bell inlet.

CAUTION

Use care not to break refrigeration tubing.

(14) Remove four screws, lock washers, washers, and loop clamps that secure charging valves, pressure relief valve, and tubing to condenser fan housing.

(15) Remove seven screws, lock washers, screw snap, and condenser air inlet guard (para 4-12).

(16) Remove five screws, lock washers, two screw snaps, and louver assembly (para 4-17).

(17) Remove seven screws attaching condenser fan housing to unit. Six screws are accessible from underneath the unit. The remaining screw is located on top of housing and secures condenser fan housing to unit by means of a bracket.

(18) Carefully remove condenser fan housing (with fan inside) by rotating housing 90° counterclockwise and pulling straight out.

(19) Separate impeller fan from condenser fan housing.

d. Replace. Replace all defective components found during inspection and test.

e. Installation/Assembly.

(1) Place impeller fan in condenser fan housing.

(2) Carefully place condenser fan housing in unit by rotating housing 90° counterclockwise and sliding into place.

(3) Secure condenser fan housing to unit with seven attaching screws.

(4) Install louver assembly and secure with five screws, lock washers, and two screw snaps (para 4-17).

(5) Install condenser air inlet guard and secure with seven screws, lock washers, and screw snap (para 4-12).

4-35. CONDENSER FAN, MOTOR, AND HOUSING.-Continued

(6) Secure charging valves, pressure relief valve, and refrigeration tubing to condenser fan housing with four loop clamps, screws, washers, and lock washer.

(7) Install bell inlet and secure with four screws.

(8) Slide motor shaft extension into hub of impeller fan and secure with setscrew.

CAUTION

After motor mounting bolts are snug, tighten bolts one full turn on each of the four bolts to compress grommets flange by .06 inches.

(9) Insert four bushings and grommets into four motor mounting holes and attach motor to mounting plate with eight flat washers, four lock washers, and four cap screws.

(10) Carefully place motor and mounting plate down into unit and align holes in motor mounting plate with those in unit.

(11) Install four cap screws and washers in motor mounting plate but do not tighten them all the way.

(12) Slide motor shaft extension onto motor shaft and secure with two setscrews.

(13) Mount actuating cylinder mounting bracket to condenser fan housing and secure with two screws and washers.

(14) Attach actuating cylinder to mounting bracket with two nuts and washers.

(15) Install pivot arm bracket and pivot arm along with two plastic washers.

(16) Secure pivot arm bracket to condenser fan housing with two screws and washers.

(17) Spin fan by hand and check for equal clearance between the inlet ring and outer edges of fan. Adjust mounting plate as necessary.

(18) Tighten cap screws in motor mounting plate and check that fan rotates freely and has adequate clearance.

4-35. CONDENSER FAN, MOTOR, AND HOUSING.-Continued

(19) Connect P4, P5, P6, P8, and P9 connector plugs and secure cable and harnesses with new plastic tie down straps or lacing cord.

(20) (Models F18H-3S and F18H-1S) Install three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(21) Connect power at power source.

4-36. EVAPORATOR COIL (CLEANING).

The evaporator coil is located in the upper front section of the air conditioner. (See fig. 4-32.)

a. Disassemble.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Remove supply air louver (para 4-14).

(4) Remove mist eliminator by pulling up and out of mounting frame.

b. Inspect.

(1) Check for accumulated dirt. Clean if accumulation of dirt is evident.

(2) Check fins for dents, bent edges, or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2). Compressed air for cleaning can create airborne particles that may enter the eyes. Wear goggles to avoid injury to personnel

CAUTION

Do not use steam to clean coil. Failure to heed this caution can result in damage to equipment.

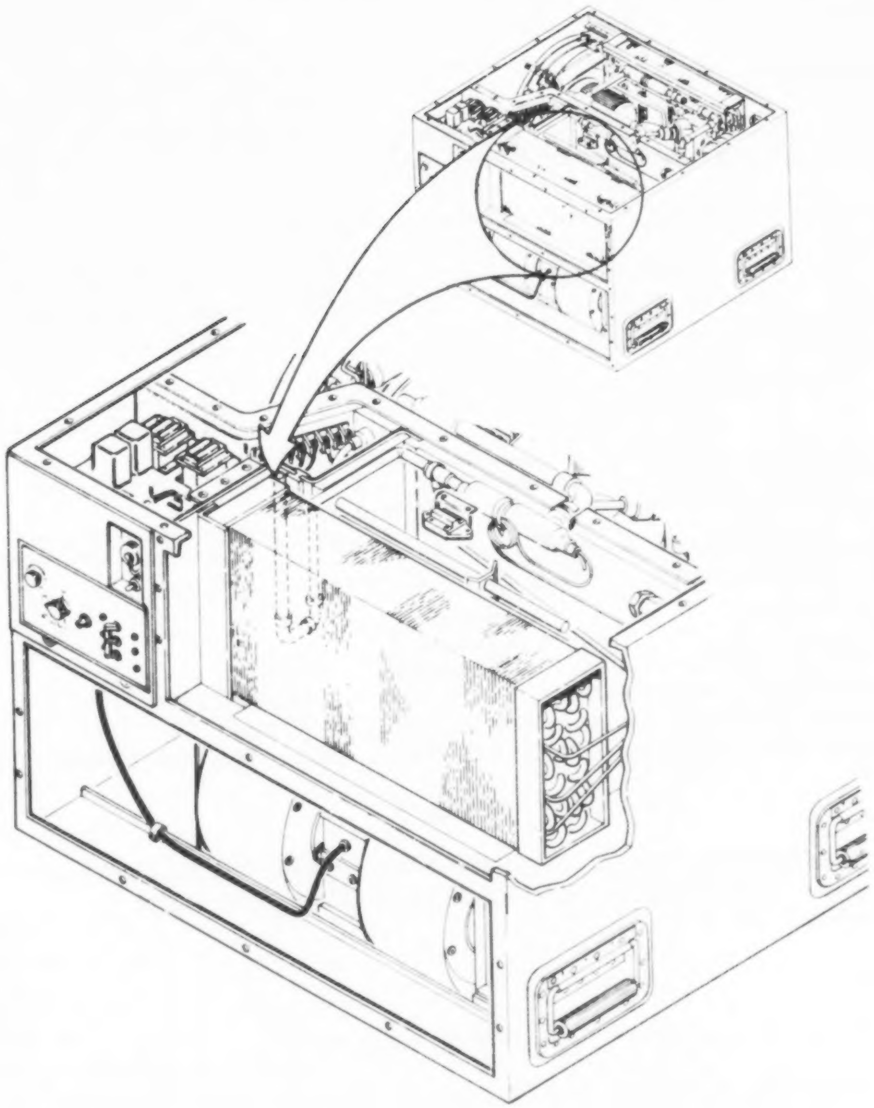


Figure 4-32. Evaporator Coil

4-36. EVAPORATOR COIL (CLEANING).-Continued

c. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner, and brush attachment, or use compressed air at 30 psi (2.1 kg/cm^2) or less from the inside of the coil to blow the dirt out. Take care to avoid fin damage. When using compressed air wear safety glasses or goggles. Dirt can be blown into your eyes. Should a leak or major damage be evident refer to direct support maintenance.

d. Assemble.

(1) Install the mist eliminator. TOP mark must be up and air flow arrows should point away from coil.

(2) Install supply air louver (para 4-14).

(3) (Models F18H-3S and F18H-1S) Install top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(4) Connect power at power source.

4-37. SOLENOID VALVE (COIL REMOVAL).

The L1 and L2 Solenoid valves are located in the rear condenser/ compressor compartment. (See fig. 4-33.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

NOTE

The following basic instructions apply to both the by-pass solenoid L1 and the pressure equalizer solenoid L2.

a. Test.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove fabric cover and top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove fabric cover and top cover (para 4-11).

(3) Disconnect the solenoid valve connector plug. P8 for L1 solenoid and P9 for L2 solenoid.

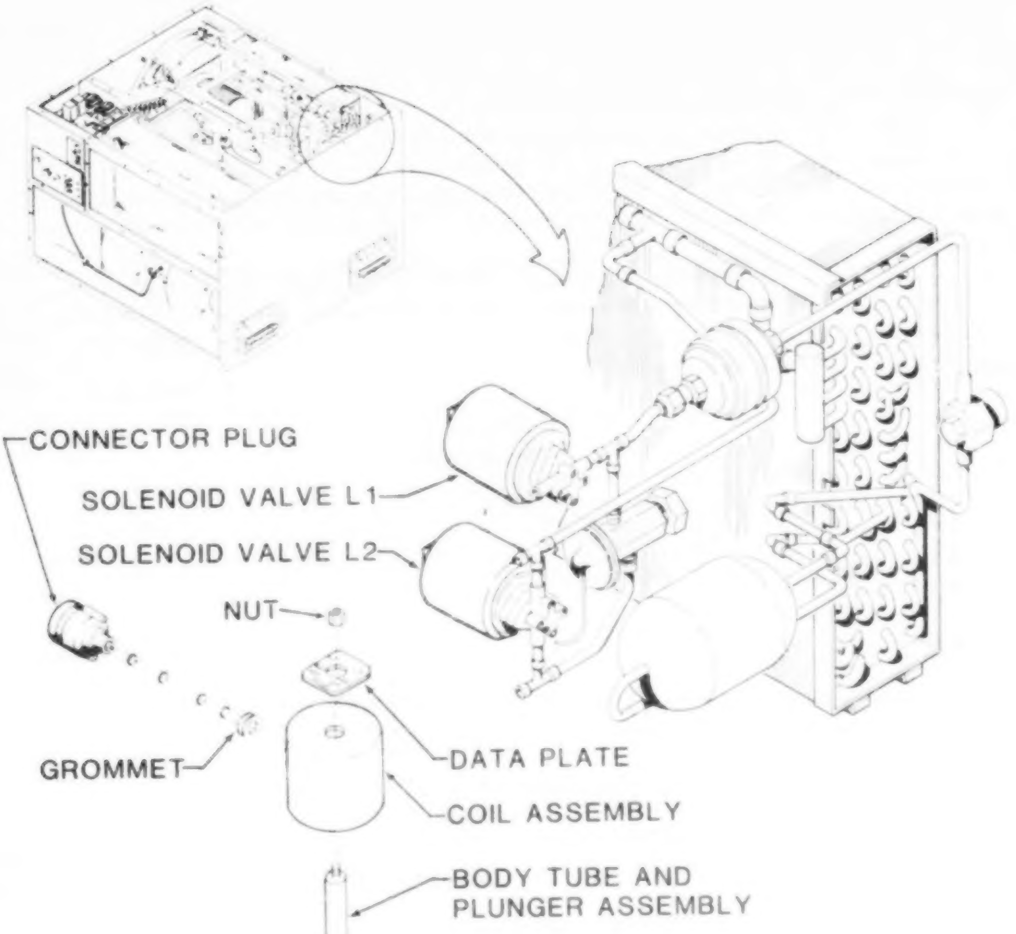

CONNECTOR PLUG
SOLENOID VALVE L1
SOLENOID VALVE L2
NUT
GROMMET
DATA PLATE
COIL ASSEMBLY
BODY TUBE AND
PLUNGER ASSEMBLY

Figure 4-33. Solenoid Valve Coil Removal

4-37. SOLENOID VALVE (COIL REMOVAL).-Continued

(4) Use continuity tester or multimeter set on lowest OHMS scale to check for continuity between pins A and B in each connector plug. If continuity is not found, the coil is open and must be replaced.

(5) Check for continuity between each pin in connector plug and coil casing. If continuity is found the coil is grounded and should be replaced.

(6) If continuity checks are satisfactory, apply 24 volts dc from an external power supply across pins A and B in connector plug. Listen for a sharp click when the valve changes position. If a click is not heard, internal valve problems are indicated and the entire valve should be replaced. Refer to direct support maintenance.

b. Repair. The only authorized repair to solenoid valve is coil replacement. The coil can be replaced without opening the refrigeration pressure system.

WARNING

Do not attempt any disassembly of the solenoid valve other than coil removal with a refrigerant charge in the system. Refrigerant will be sprayed out dangerously if the screws that attach the tube and plunger assembly to the valve body are loosened.

c. Remove.

(1) Remove top nut that attaches coil to the valve body. Remove data plate, coil, and connector plug.

(2) Cut plastic tie down straps as necessary to remove solenoid valve cable.

(3) If connector plug is to be reused unsolder it from leads.

(4) If grommet is to be reused remove it from defective coil assembly.

d. Installation.

(1) Slip grommet over leads and install in hole in coil assembly.

(2) Solder leads from coil assembly to connector plug.

4-37. SOLENOID VALVE (COIL REMOVAL).-Continued

(3) Place coil assembly and data plate on to valve body and secure with nut.

(4) Reconnect connector plug.

(5) Secure wires to existing harnesses with new plastic tie down straps or lacing cord.

(6) (Models F18H-3S and F18H-1S) Install top rear cover and fabric cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover and fabric cover (para 4-11).

(7) Connect power at power source.

4-38. LOW PRESSURE CUTOUT SWITCH (LPCO) JUMPER.

If unit is to be operated in the "cool" mode at or below 0°F (-17.8°C) ambiant the low pressure cutout (LPCO) switch (S5) must be jumpered. See figure 4-34 and proceed as follows:

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

a. Disassemble.

(1) Disconnect power at power source.

(2) Remove control module and junction box (para 4-21 and 4-26). It is not necessary to totally remove all wire connections and capillary line so long as the junction box can be pulled out enough to gain access to the pressure switches. Support the junction box so that wires and capillary line are not damaged.

(3) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(4) Install jumper wire (20 AWG minimum) between terminals 1 and 2 of low pressure cutout switch. Check that jumper will not short out against frame of control panel.

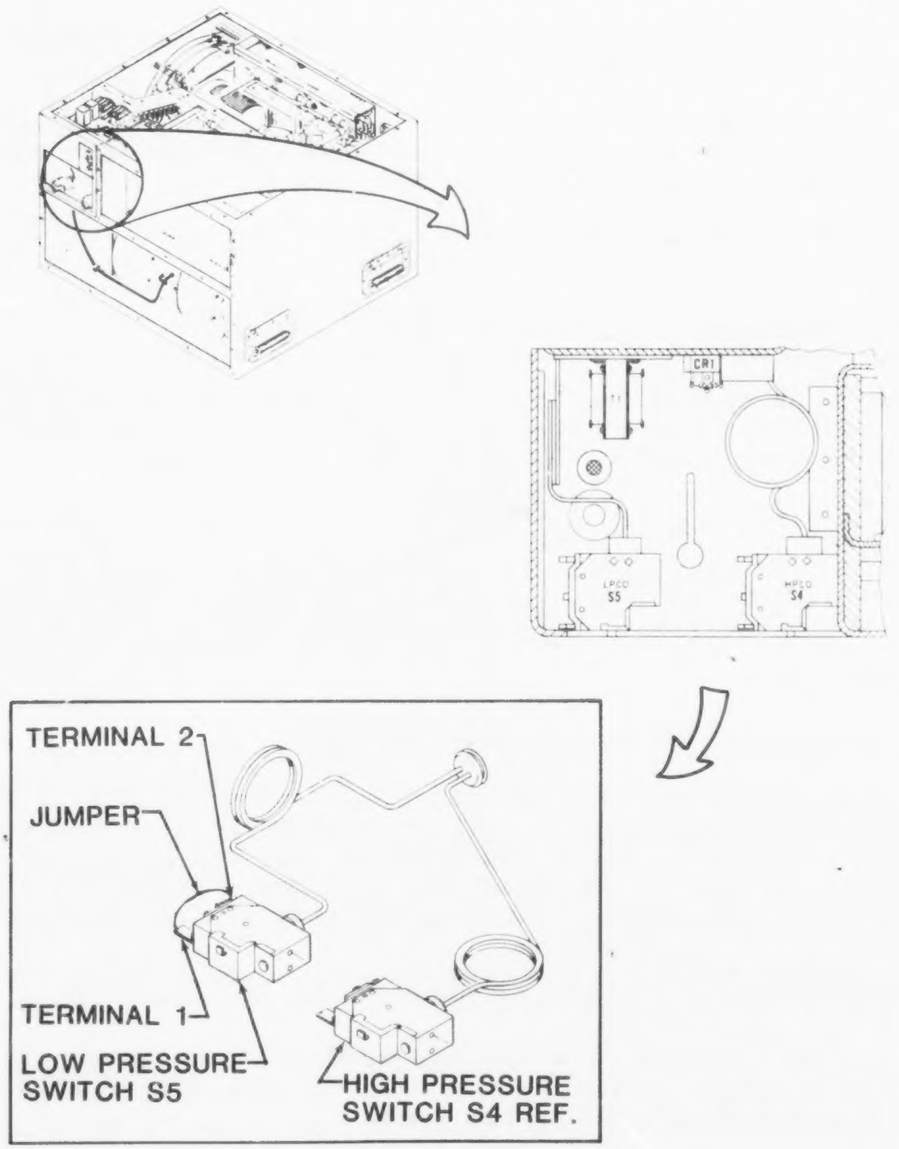

CR1
T1
LPCO
S5
HPCO
S4
TERMINAL 2
JUMPER
TERMINAL 1
LOW PRESSURE SWITCH S5
HIGH PRESSURE SWITCH S4 REF.

Figure 4-34. Jumper Across LPCO Switch

4-38. LOW PRESSURE CUTOUT SWITCH (LPCO) JUMPER.-Continued

(5) Fabricate CAUTION tag (shown below) to place on control panel to show that low pressure cutout switch has been bypassed.

> **CAUTION**
>
> Air conditioner low pressure cutout switch (S5) has been bypassed. Compressor will not shut off under low suction pressure conditions.

CAUTION TAG EXAMPLE

b. Assembly.

(1) Install junction box and control module (para 4-21 and 4-26).

(2) (Models F18H-3S and F18H-1S) Install top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(3) Connect power at power source.

NOTE

Remove the LPCO jumper when outside air temperature increases to 40°F (5°C).

4-39. CONDENSER COIL (CLEANING).

The condenser coil is located across the rear of the unit. (See fig. 4-35.)

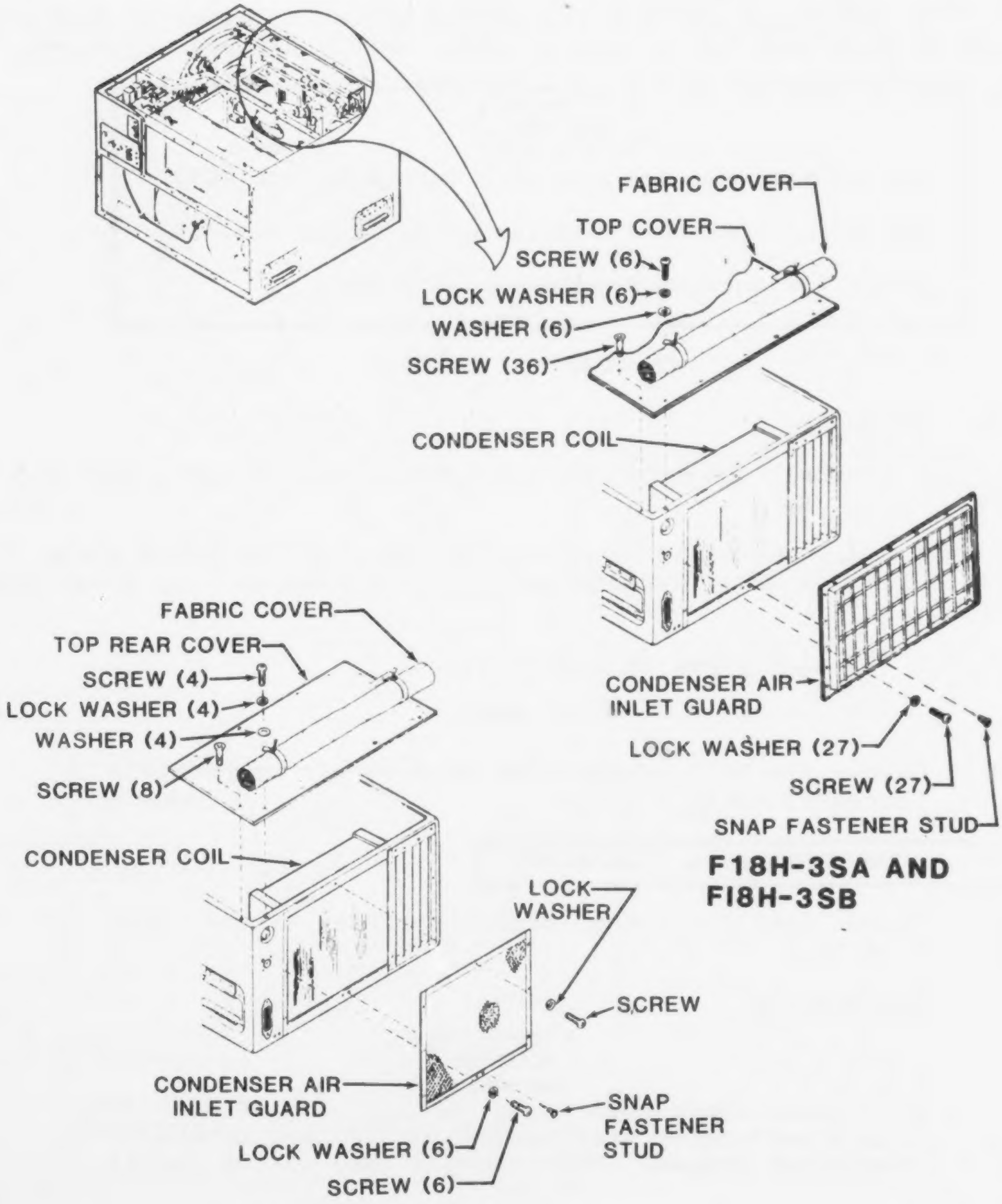
a. Disassemble.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at the power source.

(2) (Models F18H-3S and F18H-1S) Remove four screws, lock washers, washers, and fabric cover. (Models F18H-3SA and F18H-3SB) Remove six screws, lock washers, and fabric cover.


FABRIC COVER
TOP COVER
SCREW (6)
LOCK WASHER (6)
WASHER (6)
SCREW (36)
CONDENSER COIL
CONDENSER AIR INLET GUARD
LOCK WASHER (27)
SCREW (27)
SNAP FASTENER STUD
FABRIC COVER
TOP REAR COVER
SCREW (4)
LOCK WASHER (4)
WASHER (4)
SCREW (8)
CONDENSER COIL
LOCK WASHER
SCREW
CONDENSER AIR INLET GUARD
SNAP FASTENER STUD
LOCK WASHER (6)
SCREW (6)

F18H-3SA AND FI8H-3SB

F18H-3S AND F18H-1S

Figure 4-35. Condenser Coil

4-39. CONDENSER COIL (CLEANING).-Continued

(3) (Models F18H-3S and F18H-1S) Remove eight screws and top rear cover. (Models F18H-3SA and F18H-3SB) Remove thirty six screws and top cover.

NOTE

> The six screws on the vertical frames of the models F18H-3S and F18H-1S and five screws on the left vertical frame of models F18H-3SA and F18H-3SB of the condenser air inlet guard secure the condenser coil to the rear of the air conditioner housing.

(4) (Models F18H-3S and F18H-1S) Remove seven screws and lock washers, one snap fastner, and condenser air inlet guard. (Models F18H-3SA and F18H-3SB) Remove twenty seven screws and lock washers and condenser air inlet guard.

b. Inspect.

(1) Check for accumulated dirt. Clean if an accumulation of dirt is evident.

(2) Check fins for dents, bent edges or any condition that would block or distort air flow. Straighten all damaged fins with a plastic fin comb.

WARNING

> Compressed air used for cleaning purposes will not exceed 30 psi (2.1 kg/cm^2). Compressed air used for cleaning can create airborne particles that may enter the eyes. Wear goggles to avoid injury to personnel

WARNING

> Do not use steam to clean coil. Failure to heed this caution can result in personal injury or damage to equipment.

c. Cleaning. Clean coil with a soft bristled brush, vacuum cleaner, and brush attachment, or use compressed air at 30 psi or less from the inside of the coil to blow dirt out. Take care to avoid fin damage. When using compressed air wear safety glasses or goggles. Dirt can be blown into your eyes. Should a leak or major damage be evident refer to direct support maintenance.

d. Assemble.

(1) (Models F18H-3S and F18H-1S) Install condenser air inlet guard (para 4-12). (Models F18H-3SA and F18H-3SB) Install condenser air inlet guard (para 4-12).

4-39. CONDENSER COIL (CLEANING).-Continued

(2) (Models F18H-3S and F18H-1S) Install top rear cover and fabric cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(3) Connect power at power source.

4-40. HOUSING.

Inspect/Service.

a. Check for missing, loose, or damaged hardware. Replace all missing or damaged hardware.

b. Inspect for dents, bends, and cracked welds. Refer defects to be repaired to direct support maintenance.

4-41. CONNECTORS (INSTALLATION).

a. There are three connectors supplied with each air conditioner. (See fig. 4-36.)

(1) Input power cable connector (P1). This connector is used at the unit end of the input power cable. It can be connected to the J1 receptacle located above the control module or the J11 receptacle located on the upper left rear corner of the unit.

NOTE

If the J11 receptacle is used see paragraph 4-4 and figure 4-2 for wiring changes.

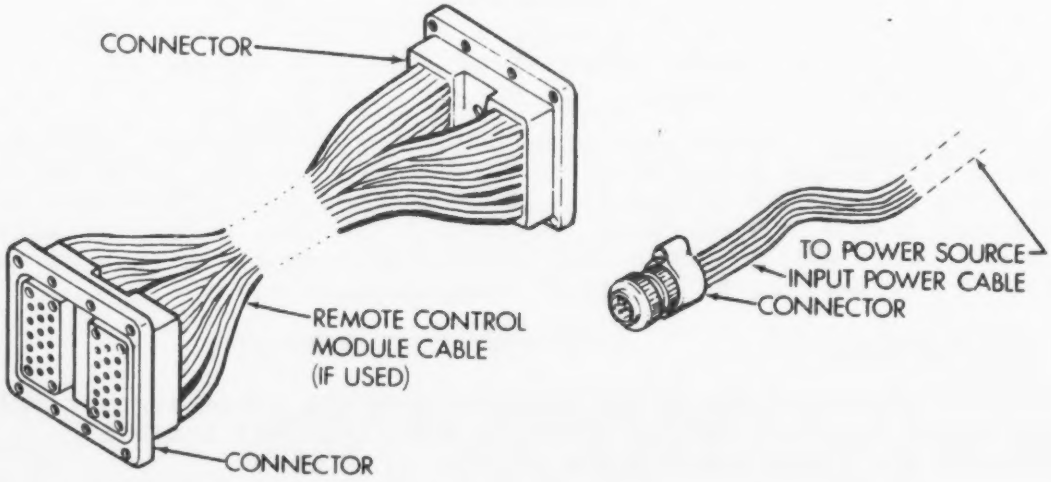

CONNECTOR
REMOTE CONTROL MODULE CABLE (IF USED)
CONNECTOR
TO POWER SOURCE
INPUT POWER CABLE
CONNECTOR

Figure 4-36. Connectors (Installation)

4-41. CONNECTORS (INSTALLATION).Continued

(2) Remote control module cable connectors. The other two connectors are used when the control module is to be installed remote from the air conditioner. (See para 4-4.)

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

b. Inspect.

(1) Disconnect power at power source.

(2) The power cable connector and the remote control cable connectors (when used) should be inspected for:

(a) Loose, missing, or damaged pins.

(b) Loose, damaged, cut, or broken wires to the connector.

(c) Loose or bad solder connections.

(d) Excessive corrosion.

(e) Obvious damage.

(3) Repair loose wires and solder connections.

c. Replace. Damaged wires or connectors and connectors with missing, loose, or damaged pins should be replaced.

4-42. INSTALLATION HARDWARE.

Each unit is supplied with mounting hardware for the four base attachment points. (See fig. 4-37.)

a. Inspect. Inspect installation hardware to be sure it is tight, properly installed, and in good condition.

b. Replace. Replace missing, damaged, or defective parts.

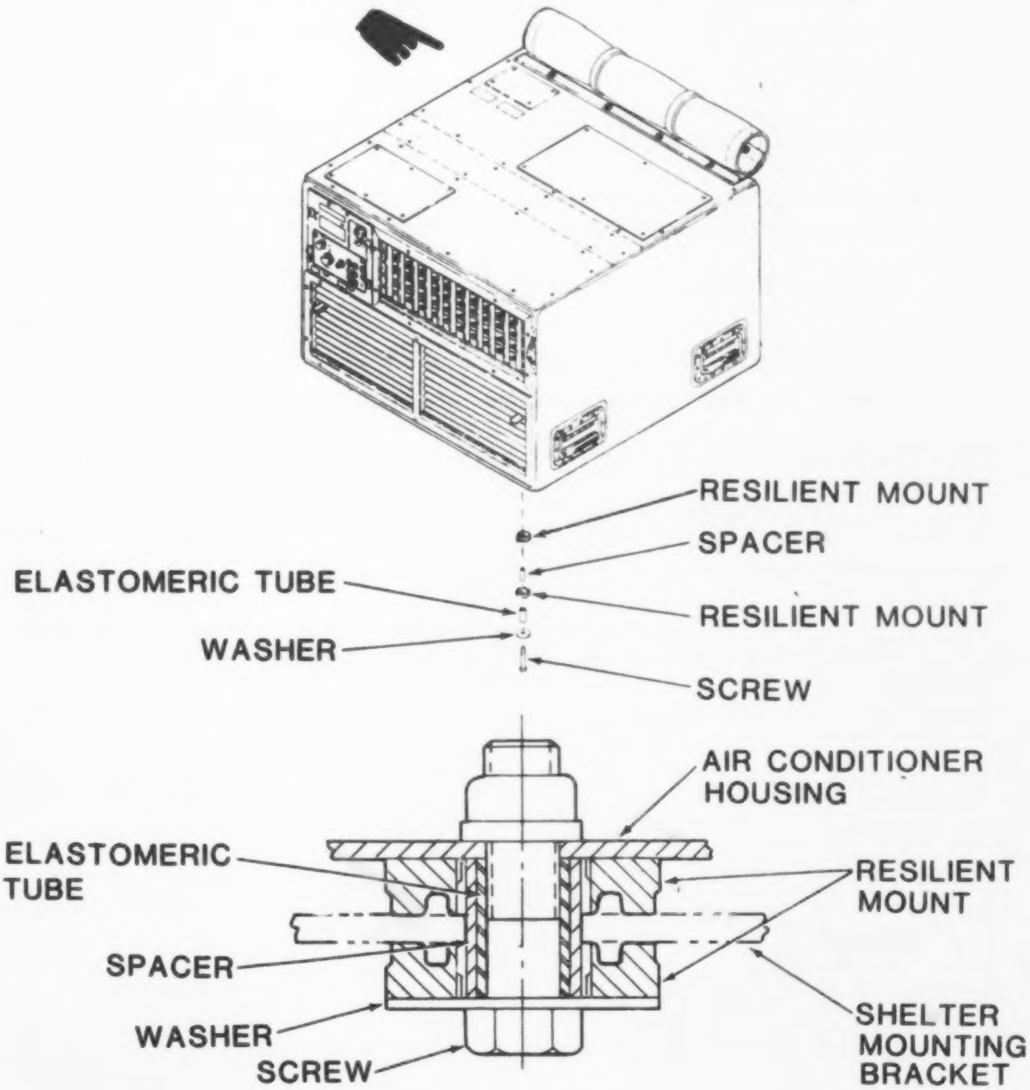

RESILIENT MOUNT
SPACER
ELASTOMERIC TUBE
RESILIENT MOUNT
WASHER
SCREW
AIR CONDITIONER HOUSING
ELASTOMERIC TUBE
RESILIENT MOUNT
SPACER
WASHER
SCREW
SHELTER MOUNTING BRACKET

Figure 4-37. Installation Hardware

Section VI PREPARATION FOR STORAGE OR SHIPMENT

4-43. PREPARATION FOR STORAGE.

a. Administrative Storage of Equipment. See TM 740-90-1. Administrative storage is short term storage -- 1 to 45 days. It covers storage of equipment which can be readied for mission performance within 24 hours. Before placing an item in administrative storage, the next scheduled preventive maintenance checks and services should be performed, all known deficiencies corrected, and all current modification work orders applied. The administrative storage site should provide required protection from the elements and allow access for visual inspection when applicable.

(1) Unroll fabric cover.

(2) Snap cover in place.

b. Intermediate Storage - 46 to 180 days. No special handling is required other than protection from damage and the elements.

(1) Unroll fabric cover.

(2) Snap cover in place.

(3) Place air conditioner in a dry, covered area.

c. Long Term or Flyable Storage. There is no time limit for this type of storage.

(1) Unroll fabric cover.

(2) Snap cover in place.

(3) Bolt unit to a skid base, preferably the original used to ship unit if it is still available and in good condition.

(4) Wrap unit with two layers of heavy plastic sheet or barrier paper.

(5) Tape and strap wrapping in place.

(6) Mark air conditioner per standard Army Procedures.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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Section I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

5-1. GENERAL.

a. Repair parts are listed and illustrated in TM5-4120-384-24P. No special tools are required for direct support maintenance of the air conditioner. Test, maintenance and diagnostic equipment (TMDE), and support equipment include standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any direct support maintenance refrigeration shop.

b. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

c. Tool Kit, Service, Refrigeration Unit, NSN 5180-00-597-1474, contains hand tools and equipment used for air conditioner maintenance. The following common items not contained in the refrigeration unit tool kit are also required for air conditioner maintenance.

Description	National Stock Number
Brush, Bristle	7520-00-223-8000
Brush, Wire	7920-00-282-9246
Bucket	7240-00-137-1609
Heat Gun	4940-01-042-4855
Multimeter	6625-00-553-0142
Pliers, Long Round Nose	5120-00-268-3579
Rubber Gloves	8415-00-266-8677
Safety Goggles	4240-00-052-3776
Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293
Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014
Nitrogen Regulator	6685-00-449-7484

Section II TROUBLESHOOTING

5-2. USE OF TROUBLESHOOTING TABLE.

a. The troubleshooting table (Table 5-1) lists the most common malfunctions which you may find during the operation or maintenance of the air conditioner. You should perform the tests/inspections and corrective actions in the order listed.

b. For a specific malfunction, perform the troubleshooting procedures listed in Table 4-2 before performing the procedures listed in Table 5-1.

c. This manual cannot list all malfunctions which may occur. However, all tests or inspections and corrective actions are listed for most common malfunctions.

d. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

WARNING

Disconnect power from the air conditioner before doing any maintenance work to the electrical system. High voltage in air conditioner can kill.

WARNING

REFRIGERANT UNDER PRESSURE
is used in the operation of this equipment.

DEATH

or severe injury may result if
personnel fail to observe safety precautions.

WARNING

Never use a heating torch on any part that contains refrigerant 22.

Avoid bodily contact with liquid refrigerant and avoid inhaling refrigerant gas.

5-2. USE OF TROUBLESHOOTING TABLE.-Continued

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing.

Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

WARNING

Prevent contact of refrigerant gas with flame or hot metal surfaces.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Table 5-1. TROUBLESHOOTING

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WARNING

High voltage can kill.

1. COMPRESSOR WILL NOT START.

NOTE

Be sure and check Item 1, Steps 1 through 6, Table 4-2 Troubleshooting for organizational maintenance before proceeding with Step 1.

Step 1. Check that the COMPR CIRCUIT BKR is ON.

Reset to ON position. If circuit breaker will not remain ON, check and/or replace. (See para 4-24.)

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 2. Check that the LOW and HIGH PRESSURE cutoff switches are not tripped.

Press and release the LOW and HIGH PRESSURE switches to RESET. If switches do not remain in, check and/or replace switches. (See para 5-27.)

Step 3. Check that the compressor motor internal overload switch is operational. (See para 5-33.)

Replace compressor if thermal cutoff switch is defective.

Step 4. Inspect and check compressor for burnout. (See para 5-33.)

Replace burned out compressor.

2. COMPRESSOR SHORT CYCLES.

Step 1. Check for obstructions in front of condenser screen.

Remove obstructions and/or roll up and secure canvas cover.

Step 2. Check for dirt in condenser coil. (See para 4-39.)

Clean condenser coil.

Step 3. Check if HIGH PRESSURE cutoff switch RESET is out.

Push and release HIGH PRESSURE switch to RESET.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing.

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Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WARNING

Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 4. Check head pressure (high pressure side). (See para 5-19.)

a. If pressure is too high, check HIGH PRESSURE cutout switch and replace if defective. (See para 5-27.)

b. If pressure is excessive and sight glass is clear, release excess refrigerant. (See para 5-11.) Release pressure until requirements of paragraph 5-19 are met.

Step 5. Check if LOW PRESSURE cutoff switch RESET is tripped.

Push and release LOW PRESSURE switch to RESET. (See para 2-2.)

Step 6. Check head pressure (low pressure side). (See para 5-19.)

Add refrigerant if low. (See para 5-16.)

Step 7. Check quench valve. (See para 5-23.)

Replace if defective.

Step 8. Check compressor motor internal overload switch. (See para 5-33.)

Replace compressor if internal overload switch is defective.

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
  TEST OR INSPECTION
    CORRECTIVE ACTION

Step 9. Check solenoid valves L1 and L2. (See para 5-24.)

Repair or replace if defective.

3. INSUFFICIENT COOLING ACTION.

Step 1. Check control settings. (See para 2-2.)

a. Move MODE SELECTOR switch to COOL.

b. Move TEMPERATURE SELECTOR switch to COOLER. If normal cooling does not resume in 15 minutes, go to Step 2.

Step 2. Check air movement.

a. Remove any obstructions to air flow (evaporator and condenser sides).

b. Remove, clean, and/or replace air filter. (See para 4-13.)

c. Remove, clean, and/or replace mist eliminator. (See para 4-16.)

d. Clean evaporator coil. (See para 4-36.)

NOTE

Frost on the evaporator coil is usually caused by an obstruction to air flow or dirty coils, filter, or mist eliminator.

Step 3. Check actuating cylinder to make sure louvers are opening. (See para 5-26.)

Replace if defective.

Step 4. Check to make sure evaporator and condenser fans are tight on motor shaft. (See para 4-32 and 4-35.)

Tighten if loose.

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 5. Check area near condenser guard and fresh air inlet for heat hource over 120°F (40°C).

Remove heat source.

Step 6. Check sight glass after operating unit for 15 minutes with TEMPERATURE SELECTOR switch in maximum COOLER position. Center should be bubble free and green.

If charge is low add refrigerant. (See para 5-16.) Bubbles may also be caused by clogged dehydrator. (See para 5-31.)

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing.

Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 7. Check for refrigerant leaks. (See para 5-14.)

Repair or change defective part.

WARNING

High voltage can kill.

Step 8. Check solenoid valves L1 and L2. (See para 5-24.)

Repair or replace if defective.

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 9. Check pressure regulator valve. (See para 5-25.)

Replace if defective.

Step 10. Check expansion valve for proper operation. (See para 5-22.)

Replace if defective.

Step 11. Check quench valve for proper operation. (See para 5-23.)

Replace if defective.

4. REFRIGERANT SYSTEM CONTINUOUSLY LOSING REFRIGERANT.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing.

Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Step 1. Check refrigerant tubing and components for leaks using a leak detector. (See para 5-14.)

Repair or replace as required.

Step 2. Check pressure relief valve. (See para 5-29.)

Replace if defective.

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

5. UNIT OPERATES CONTINUOUSLY ON COOLING CYCLE.

Step 1. Check position of TEMPERATURE SELECTOR switch. (See para 2-2.)

Move selector to WARMER.

WARNING

High voltage can kill.

Step 2. Check TEMPERATURE SELECTOR switch S3. (See para 4-22.)

Replace if defective.

WARNING

High voltage can kill.

Step 3. Check solenoid valve L1. (See para 5-24.)

Replace if defective.

6. SIGHT GLASS APPEARS YELLOW INSTEAD OF GREEN.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing.

Wear thermal protective gloves and a face protector or safety glasses in any situation where skin or eye contact is possible.

Prevent contact of refrigerant gas with flame or hot metal surfaces.

Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

Table 5-1. TROUBLESHOOTING-Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 1. Yellow appearance of sight glass is caused by contamination in the refrigerant.

a. Release refrigerant. (See para 5-11.)

b. Remove dehydrator. (See para 5-31.)

c. Purge and dry system. (See para 5-12.)

d. Install new dehydrator. (See para 5-31.)

e. Leak test system. (See para 5-14.)

f. Evacuate system. (See para 5-15.)

g. Recharge with refrigerant. (See para 5-16.)

Step 2. Check for yellow in sight glass after allowing compressor to run for at least 1 hour.

Repeat corrective action in Step 1 above.

7. AIR CONDITIONER NOISY DURING OPERATION.

Step 1. Check expansion valve. (See para 5-22.)

Replace if defective.

Step 2. Check quench valve. (See para 5-23.)

Replace if defective.

Step 3. Check compressor for internal noise and loose mounting. (See para 5-33.)

a. Repair loose mounting.

b. Replace compressor if defective.

Section III MAINTENANCE PROCEDURES

5-3. GENERAL.

The procedures in this section have been arranged in the order in which the items appear in the direct (F) maintenance level column on the Maintenance Allocation Chart (MAC) which is provided in Appendix B. Step-by-step procedures have been provided for all action authorized to be performed by direct maintenance in the order in which they appear on the MAC. Actions authorized to be performed by organizational and general support maintenance have been duly noted; step-by-step procedures for organizational and general support maintenance actions may be found in Chapters 4 and 6 respectively.

5-4. FABRIC COVER.

For removal, inspection, lubrication, cleaning and installation see paragraph 4-10.

a. Repair. Minor rips, cuts, tears, or punctures may be repaired by applying a patch to the inside surface.

b. Replace. For damage of greater extent, or missing eyelets or snap fasteners, replace the entire cover.

5-5. TOP COVERS.

For removal, cleaning, inspection, and installation see paragraph 4-11.

a. Repair. The only authorized repairs for these panels are replacement of gaskets, insulation and information plates.

(1) Use only gaskets, insulation, or name plates identified in TM5-4120-384-24P.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List. (See Appendix E.)

(2) Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

5-5. TOP COVERS.-Continued

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(3) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(4) Coat mating surfaces of metal and gasket with adhesive. Let both surfaces air dry until adhesive is tacky but will not stick to fingers.

(5) Starting with an end, carefully attach gasket to the metal. Press into firm contact all over.

(6) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

(7) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replace. Replace panels that are badly dented, bent, or punctured.

5-6. SCREENS, GUARDS, AND LOUVERS.

For removal, cleaning, servicing, inspection, and installation see paragraphs 4-12, 4-13, and 4-14.

a. Repair. The only authorized repairs are replacements of gaskets and the straightening of bent blades.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List. (See Appendix E.)

(1) Remove as much old gasket material as possible by pulling or scraping it away from the metal surface.

5-6. SCREENS, GUARDS, AND LOUVERS.-Continued

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl ketone (MEK) and a stiff brush.

(3) Coat mating surfaces of metal and gasket with adhesive. Let both surfaces air dry until adhesive is tacky but will not stick to fingers.

(4) Starting with an end, carefully attach gasket to metal. Press into firm contact all over.

(5) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

(6) Straighten slightly bent louver blades by hand.

(7) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replace. Replace screens, guards, or louvers that are badly dented or bent or screens that are punctured or torn.

5-7. INFORMATION PLATES.

See figure 2-3 for location and information contained on Warning and instruction plates.

Replace. If any plates are missing, damaged, or illegible, they should be replaced.

a. Remove old plate by drilling rivets out. Use a drill stop or similar tool to avoid damage to internal parts.

b. Install new plate with proper size rivets.

5-8. EVAPORATOR, FAN, MOTOR, AND HOUSING REPAIR.

Direct support maintenance repair of the evaporator fan motor is limited to replacement of the electrical connector, thermal overloads, and bearings. Repair of the evaporator fan and fan housing is by replacement. For access, inspection, testing, removal and installation see paragraph 4-32.

NOTE

> Check nameplate on motor for manufacturer and model number and use repair instructions below which pertain to the motor in your air conditioner.

Repair. Authorized repair of Motor Assembly, Custom Motor Design, Model 184-01-0412 is accomplished using the following procedures a, b, and c. (See fig. 5-1.) For Keco Industries, Inc. Model 113K0001 or 113K0090 see following procedures d, e, and f. (See fig. 5-1.1.) For additional information on electric motor repair refer to FM 20-31 (Electric Motor and Generator Repair).

a. To replace connector on Custom Motor Design motor:

(1) Loosen cable clamp.

(2) Tag and unsolder leads.

(3) Remove old connector.

(4) See wiring diagram figure 4-4 and tags and solder lead to new connector. Remove tags.

(5) Secure cable clamp.

b. To replace overload (thermal) protectors on Custom Motor Design motor: Thermal protectors are not replaceable on this motor. If testing (para 4-32) indicates an open thermal protector, replace motor.

c. To replace bearings on Custom Motor Design motor:

(1) Match-mark stator and end bracket to ease reassembly.

(2) Remove four screws from end bracket.

(3) Carefully separate end bracket from stator. Using a brass or plastic bar and hammer tap opposite sides, top, and bottom in alternating sequence to break end bracket loose.

(4) Remove end bracket.

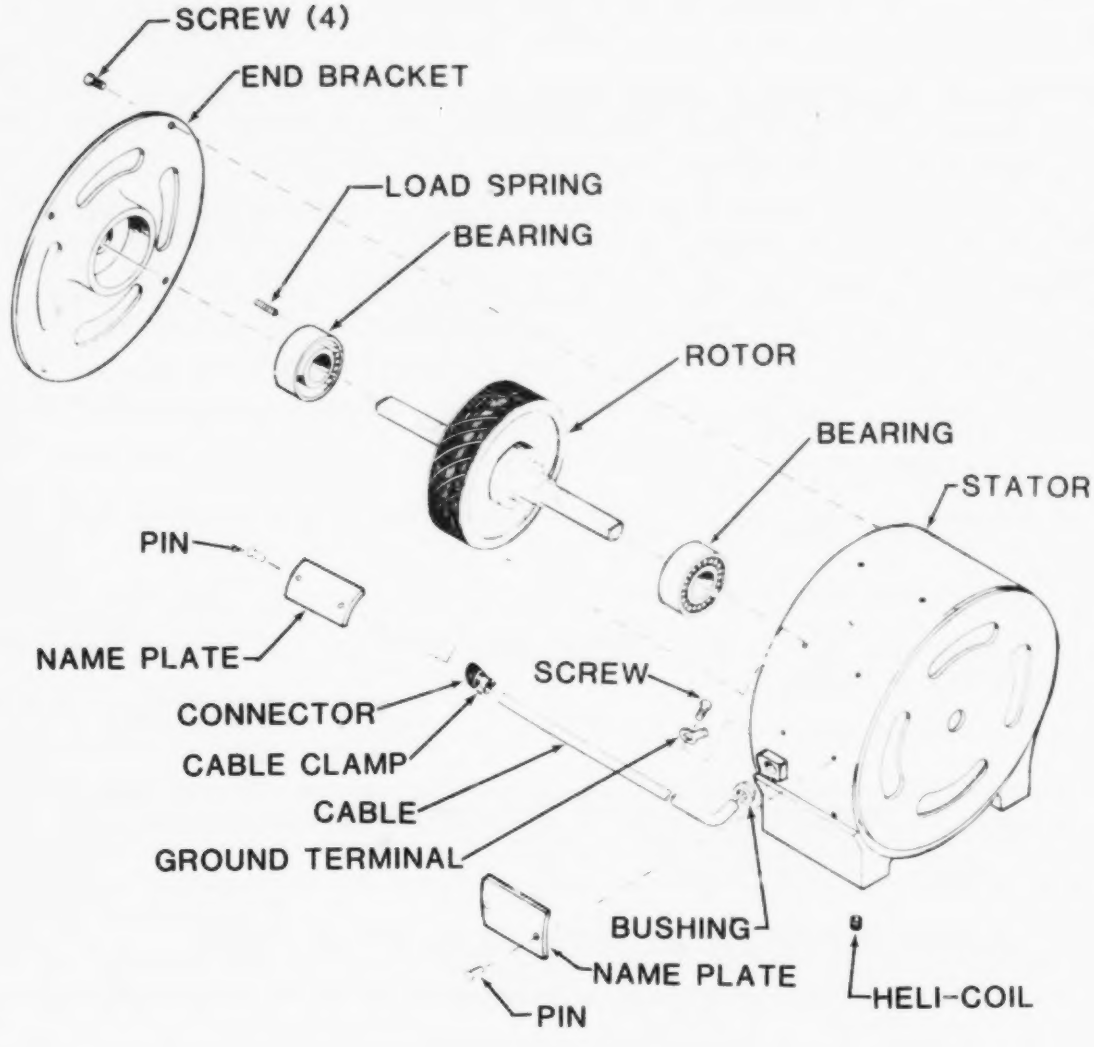
SCREW (4)
END BRACKET
LOAD SPRING
BEARING
ROTOR
BEARING
STATOR
PIN
NAME PLATE
SCREW
CONNECTOR
CABLE CLAMP
CABLE
GROUND TERMINAL
BUSHING
NAME PLATE
PIN
HELI-COIL

Figure 5-1. Motor Assembly, Custom Motor Design, Model 184-01-0412

5-8. EVAPORATOR, FAN, MOTOR, AND HOUSING REPAIR.-Continued

NOTE

Be sure load spring is not lost during motor disassembly. Note its position for use in reassembly.

(5) Carefully slide rotor out of stator housing.

(6) Press out or carefully drive bearings out of end bracket and stator housing. Retain load spring for use at reassembly if not damaged.

(7) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(8) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace motor.

(9) Coat shaft surfaces of rotor with oil (MIL-L-2104, Grade 20) and slide bearings on shaft ends. They should seat against shoulders at the inner ends of shaft.

(10) Coat the bearing cavity of end bracket and stator housing with oil, and carefully slide rotor into stator until bearing is seated.

(11) Work end bracket onto shaft until bore fits over end of stator. Keep matchmark made during disassembly in alignment.

(12) Place four screws through end bracket into stator housing.

(13) Tap around end-bracket with a plastic or rawhide mallet while tightening screws. Tighten in alternating sequence until all screws are equally tightened. Check for freedom of rotation by turning motor shaft by hand. There should be no drag or binding.

d. To replace connector on Keco Industries, Inc. motor:

(1) Loosen cable clamp.

(2) Tag and unsolder leads.

(3) Remove old connector.

(4) See wiring diagram figure 4-4 and tags and solder lead to new connector. Remove tags.

(5) Secure cable clamp.

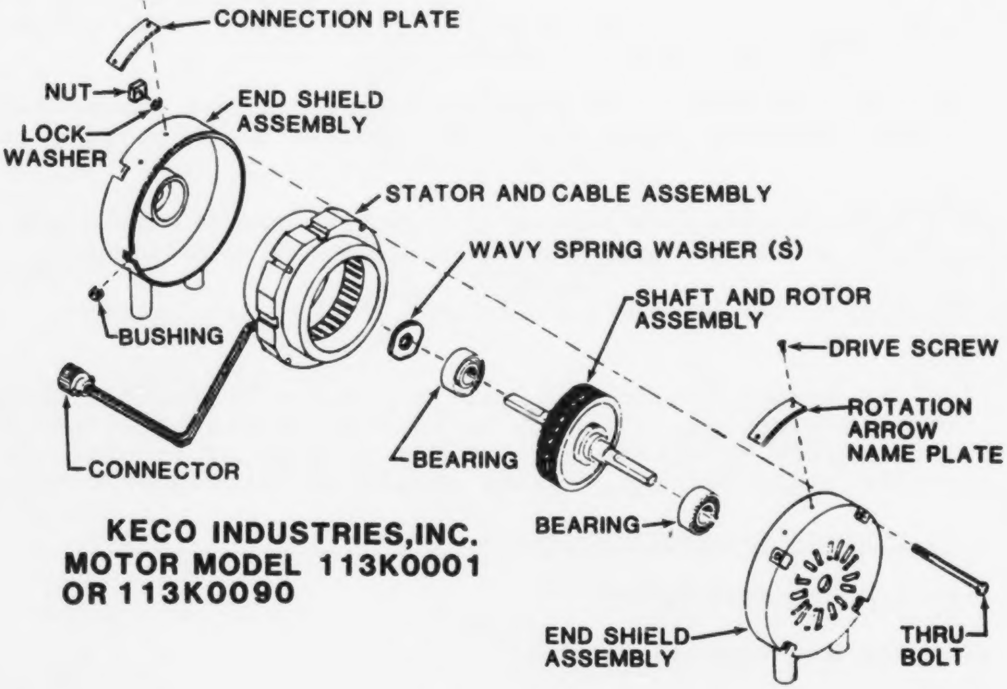
DRIVE SCREW
CONNECTION PLATE
NUT
LOCK WASHER
END SHIELD ASSEMBLY
STATOR AND CABLE ASSEMBLY
WAVY SPRING WASHER (S)
SHAFT AND ROTOR ASSEMBLY
DRIVE SCREW
ROTATION ARROW NAME PLATE
BUSHING
CONNECTOR
BEARING
BEARING
KECO INDUSTRIES,INC.
MOTOR MODEL 113K0001
OR 113K0090
END SHIELD ASSEMBLY
THRU BOLT

Figure 5-1.1 Motor Assembly, Keco Industries, Inc., Model 113K0001 or 113K0090

5-8. EVAPORATOR, FAN, MOTOR, AND HOUSING REPAIR.-Continued

e. To replace overload (thermal) protectors on Keco Industries, Inc. motor: Thermal protectors are not replaceable on this motor. If testing (para 4-32) indicates an open thermal protector, replace motor.

f. To replace bearings on Keco Industries, Inc. motor:

(1) Match-mark stator and end shield assemblies to ease reassembly.

(2) Remove four thru bolts, nuts and lock washers.

(3) Carefully separate end shield assemblies from stator and cable assembly. Using a brass or plastic bar and hammer tap opposite sides, top, and bottom in alternating sequence to break end shield assemblies loose.

(4) Remove end shield assemblies.

NOTE

Be sure load wavy spring washer(s) are not lost during motor disassembly. Note their position for use in reassembly.

(5) Pull or carefully drive bearings off of rotor assembly. Retain wavy spring washer(s) for use at reassembly if not damaged.

(6) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(7) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace motor.

(8) Coat shaft surfaces of rotor with oil (MIL-L-2104, Grade 20) and slide bearings on shaft ends. They should seat against shoulders at the inner ends of shaft.

(9) Coat the bearing cavity of end shield assemblies with oil.

(10) Coat wavy spring washer(s) with oil (MIL-L-2104, Grade 20).

(11) Carefully slip end shield assemblies, stator and cable assembly, and shaft and rotor assembly back together. Take care that wavy spring washer(s) and match marks are in their original position.

(12) Place four thru bolts thru motor assembly and secure with four nuts and lock washers. Check for freedom of rotation by turning motor shaft by hand. There should be no drag or binding.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.

Direct support maintenance repair of the condenser fan motor is limited to replacement of the electrical connector, thermal overloads, and bearings. Repair of the condenser fan and fan housing is by replacement. For access, inspection, testing, removal and installation see paragraph 4-35.

NOTE

> Check nameplate on motor for manufacturer and model number and use repair instructions below which pertain to the motor in your air conditioner.

Repair. For additional information on electric motor repair refer to FM 20-31 (Electric Motor and Generator Repair).

a. Motor Assembly, Welco Industries Inc., Model M4720-50. (See fig. 5-2.)

(1) To replace connector:

(a) Loosen cable clamp.

(b) Tag and unsolder leads.

(c) Remove old connector.

(d) See wiring diagram figure 4-4 and tags and solder leads to new connector. Remove tags.

(e) Secure cable clamp.

(2) To replace overload (thermal) protectors: Overload protectors are not replaceable on this motor. If testing (para 4-35) indicates an open overload protector, replace motor.

(3) To replace bearings:

(a) Match-mark stator and both end brackets to ease reassembly.

(b) Remove four screws each from front and rear brackets.

(c) Carefully separate end brackets from stator. Using a brass or plastic bar and hammer tap opposite sides, top and bottom in alternating sequence to break end brackets loose.

(d) Remove end brackets.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

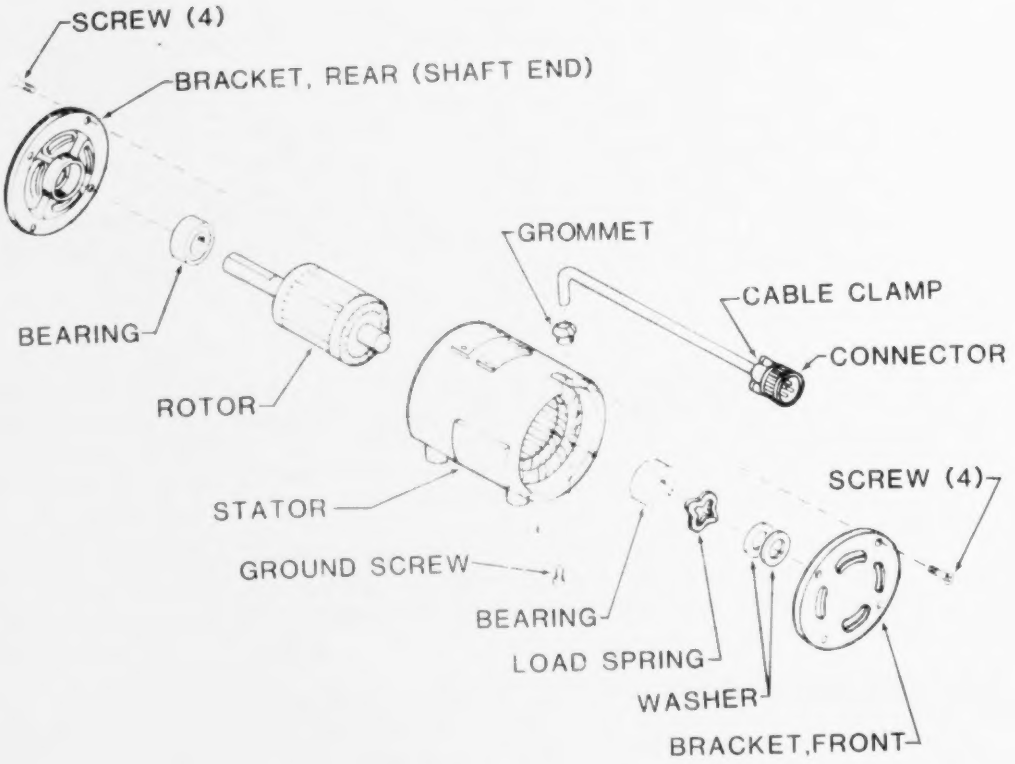
SCREW (4)
BRACKET, REAR (SHAFT END)
GROMMET
CABLE CLAMP
CONNECTOR
BEARING
ROTOR
STATOR
SCREW (4)
GROUND SCREW
BEARING
LOAD SPRING
WASHER
BRACKET,FRONT

Figure 5-2. Motor Assembly, Welco Model M-4720-50

(e) Press out or carefully drive bearings out of end brackets. Retain washers and load spring from front bracket for use at reassembly if they are not damaged.

(f) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(g) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace motor.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

(h) Coat shaft surfaces of rotor with oil (MIL-L-2104, Grade 20) and slide bearings on shaft ends. They should seat against shoulders at the inner ends of shaft.

(i) Coat washers and load spring with oil (MIL-L-2104, Grade 20) and slide them over end of front shaft with load spring installed first.

(j) Coat bearing cavity of each end-bracket with oil. Slide end-bracket carefully into position over shaft so that OD of bearing enters ID of bearing cavity in end-bracket. Work end-brackets onto shaft until bore fits over end of stator. Keep match-marks made at time of disassembly in alignment.

(k) Place four screws in each end-bracket.

(l) Tap around both end-brackets with a plastic or rawhide mallet while tightening screws. Tighten in alternating sequence until all screws are equally tightened. Check for freedom of rotation by turning motor shaft by hand. There should be no drag or binding.

(m) Check end-play of shaft. End play should be 0.002 - 0.005 inch (0.051 - 0.127 mm). If end-play is not within limits, disassemble motor and add or remove shims to adjust.

b. Motor Assembly, Custom Motor Design, Model 700-01-0602. (See fig. 5-3.)

(1) To replace connector:

(a) Loosen cable clamp.

(b) Tag and unsolder leads.

(c) Remove old connector.

(d) See wiring diagram figure 4-4 and tags and solder leads to new connector. Remove tags.

(e) Secure cable clamp.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

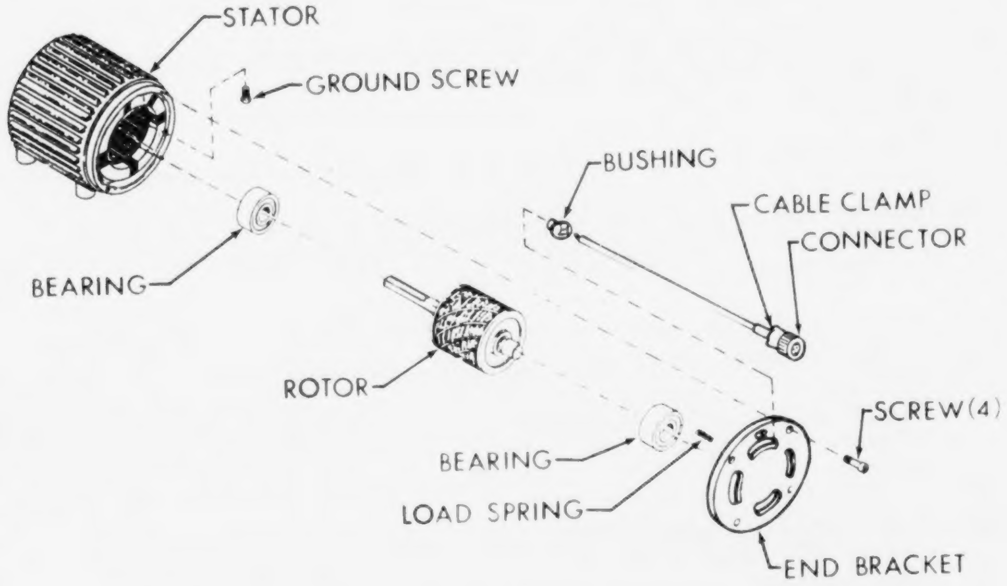
STATOR
GROUND SCREW
BUSHING
CABLE CLAMP
CONNECTOR
BEARING
ROTOR
SCREW(4)
BEARING
LOAD SPRING
END BRACKET

Figure 5-3. Motor Assembly, Custom Motor Design, Model 700-01-0602

(2) To replace overload (thermal) protectors: Overload protectors are not replaceable on this motor. If testing (para 4-35) indicates an open overload protector, replace motor.

(3) To replace bearings:

(a) Match-mark stator and end bell to ease reassembly.

(b) Remove four screws from end bracket.

(c) Carefully separate end bracket from stator. Using a brass or plastic bar and hammer tap opposite sides, top, and bottom in alternating sequence to break end bracket loose.

CAUTION

Remove the end bracket carefully to avoid damaging wires. Wires may be left in place if care is taken to avoid damaging them.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

(d) Remove end bracket.

NOTE

Be sure load spring is not lost during motor disassembly. Note its position for use in reassembly.

(e) Carefully slide rotor out of stator housing.

(f) Press out or carefully drive bearings out of end bracket and stator housing. Retain load spring for use at reassembly if not damaged.

(g) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(h) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace motor.

(i) Coat shaft surfaces of rotor with oil (MIL-L-2104, Grade 20) and slide bearings on shaft ends. They should seat against shoulders at the inner ends of shaft.

(j) Coat the bearing cavity of end bracket and stator housing with oil and carefully slide rotor into stator until bearing is seated.

(k) Work end bracket onto shaft until bore fits over end of stator. Keep the matchmark made during disassembly in alignment.

(l) Place four screws through end bracket into stator housing.

(m) Tap around end-bracket with a plastic or rawhide mallet while tightening screws. Tighten in alternating sequence until all screws are equally tightened. Check for freedom of rotation by turning motor shaft by hand. There should be no drag or binding.

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

c. Motor Assembly, Keco Industries, Inc., Model 113K0000. (See fig. 5-3.1)

(1) To replace connector:

(a) Loosen cable clamp.

(b) Tag and unsolder leads.

(c) Remove old connector.

(d) See wiring diagram figure 4-4 and tags and solder leads to new connector. Remove tags.

(e) Secure cable clamp.

(2) To replace overload (thermal) protectors: Overload protectors are not replaceable on this motor. If testing (para 4-35) indicates an open overload protector, replace motor.

(3) To replace bearings:

(a) Match-mark stator and end shield assemblies to ease reassembly.

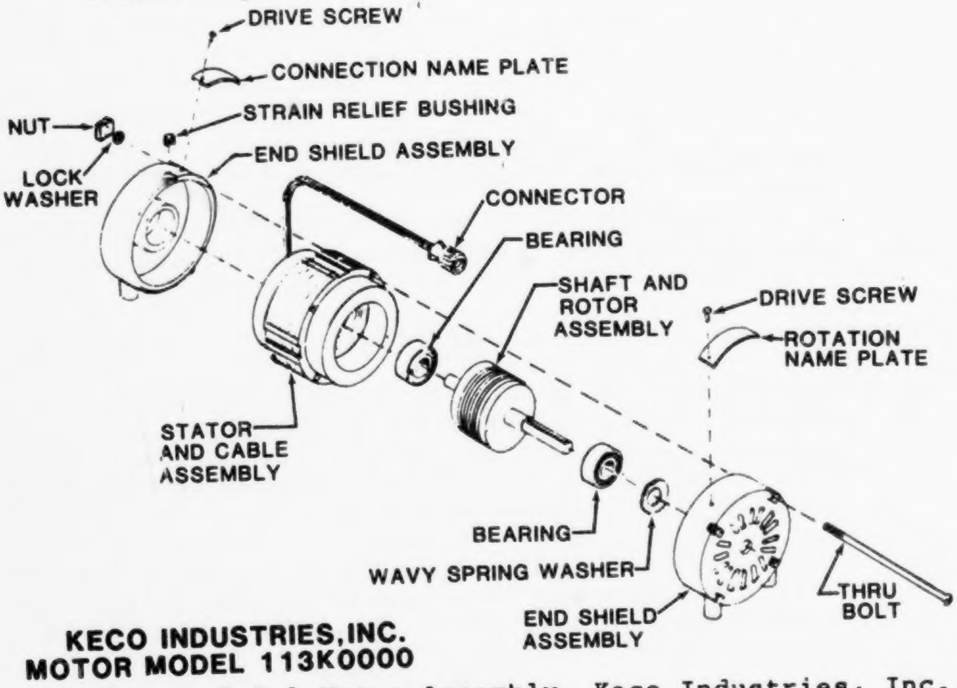
DRIVE SCREW
CONNECTION NAME PLATE
STRAIN RELIEF BUSHING
NUT
LOCK WASHER
END SHIELD ASSEMBLY
CONNECTOR
BEARING
SHAFT AND ROTOR ASSEMBLY
DRIVE SCREW
ROTATION NAME PLATE
STATOR AND CABLE ASSEMBLY
BEARING
WAVY SPRING WASHER
END SHIELD ASSEMBLY
THRU BOLT
KECO INDUSTRIES,INC.
MOTOR MODEL 113K0000

Figure 5-3.1 Motor Assembly, Keco Industries, Inc., Model 113K0000

5-9. CONDENSER FAN, MOTOR, AND HOUSING REPAIR.-Continued

(b) Remove four thru bolts, nuts and lock washers.

(c) Carefully separate end shield assemblies from stator and cable assembly. Using a brass or plastic bar and hammer tap opposite sides, top, and bottom in alternating sequence to break end bracket loose.

(d) Remove end shield assemblies.

NOTE

Be sure load wavy spring washer(s) are not lost during motor disassembly. Note their position for use in reassembly.

(e) Pull or carefully drive bearings off of rotor assembly. Retain wavy spring washer(s) for use at reassembly if not damaged.

(f) Examine rotor, stator, and shafts for nicks, gouges, deformations, and evidence of overheating.

(g) Dress high metal defects in shafts with a fine file or stone. If damage exceeds repairable limits, replace motor.

(h) Coat shaft surfaces of rotor with oil (MIL-L-2104, Grade 20) and slide bearings on shaft ends. They should seat against shoulders at the inner ends of shaft.

(i) Coat the bearing cavity of end shield assemblies with oil.

(j) Coat wavy spring washer(s) with oil (MIL-L-2104, Grade 20).

(k) Carefully slip end shield assemblies, stator and cable assembly, and shaft and rotor assembly back together. Take care that wavy spring washer(s) and match marks are in their original position.

(l) Place four thru bolts thru motor assembly and secure with four nuts and lock washers. Check for freedom of rotation by turning motor shaft by hand. There should be no drag or binding.

5-10. REFRIGERATION SYSTEM REPAIRS GENERAL.

The refrigeration system must be totally discharged before any maintenance action is performed on any system component. Leak testing and dehydrator replacement is required after any system component has been removed and replaced. The system must be evacuated before it is charged. The system must be properly charged to function properly.

WARNING

DANGEROUS CHEMICAL
is used in this equipment.

DEATH

or severe injury may result if personnel
fail to observe safety precautions.

Use great care to avoid contact with liquid refrigerant gas being discharged under pressure. Sudden and irreverisble tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin - eye - contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

WARNING

REFRIGERANT UNDER PRESSURE
is used
in the operation of this equipment.

DEATH

or severe injury may result if you fail
to observe safety precautions.

Never use a heating torch on any part that contains Refrigerant R-22. Do not let liquid refrigerant touch you and do not inhale refrigerant gas.

5-11. DISCHARGING THE REFRIGERANT SYSTEM.

(See fig. 5-4.)

WARNING

Death or severe injury may result if personnel fail to observe safety precautions. Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin - eye - contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

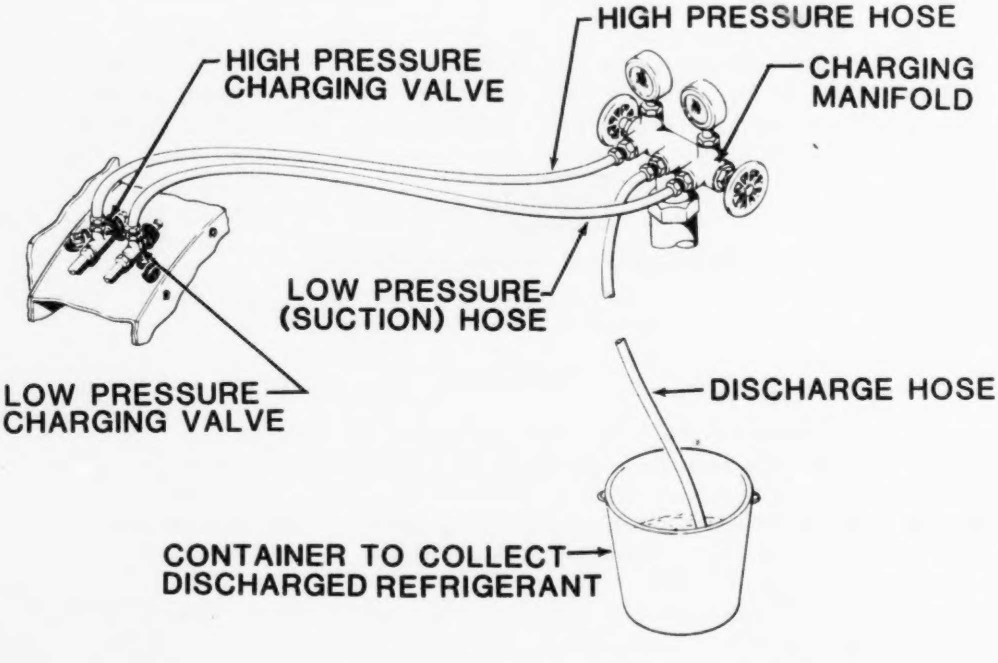
HIGH PRESSURE HOSE
HIGH PRESSURE CHARGING VALVE
CHARGING MANIFOLD
LOW PRESSURE (SUCTION) HOSE
LOW PRESSURE CHARGING VALVE
DISCHARGE HOSE
CONTAINER TO COLLECT DISCHARGED REFRIGERANT

Figure 5-4. Discharging Refrigerant

5-11. DISCHARGING THE REFRIGERANT SYSTEM.-Continued

a. Disconnect power at power source.

b. On models F18H-3S and F18H-1S remove four screws and refrigerant charging valve access cover. On all other models remove top cover (para 4-11).

c. Connect charging manifold to charging valves.

d. Attach hose assembly to center connection of manifold.

e. Place open end of center connection hose in a container located in a well ventilated area.

f. Open both manifold valves.

WARNING

Discharge refrigerant in an open area and not around an open flame.

CAUTION

Do not permit oil to escape from unit. If oil is escaping, close valve slightly.

Do not permit refrigerant to escape fast enough to form ice or frost on either the lines or valve.

g. Using a refrigeration wrench, slowly open low pressure charging valve to allow refrigerant gas to flow slowly out of hose.

h. Using a refrigeration wrench, slowly open high pressure charging valve to allow refrigerant gas to flow slowly out of hose.

i. Check discharge hose for presence of oil. Adjust valves if necessary to prevent oil discharge.

j. When gas stops flowing close both service valves.

5-12. PURGING THE REFRIGERANT SYSTEM.

(See fig. 5-5.)

The refrigeration system must be purged with dry nitrogen, item 8, Appendix E before any brazing is performed on any components. A flow of dry nitrogen at the rate of 1 - 2 cfm (0.028 - 0.057 m^3/minute) should be continued during all brazing operations to minimize internal oxidation and scaling.

CAUTION

Nitrogen cylinders are pressurized containers. The pressure in the cylinder can exceed 2000 psi. A nitrogen pressure regulator should be used at all times when nitrogen is used for leak check or purge operations.

CAUTION

Nitrogen is an inert gas; however, it also presents danger as a suffocant and, therefore, must also be discharged in a ventilated location.

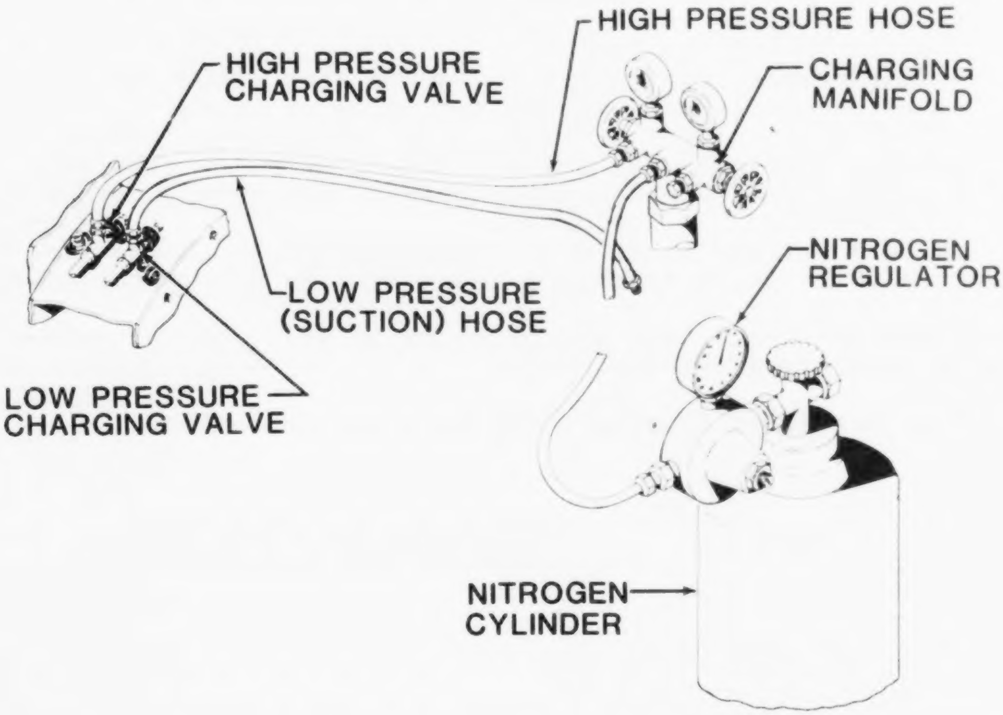
HIGH PRESSURE HOSE
HIGH PRESSURE CHARGING VALVE
CHARGING MANIFOLD
NITROGEN REGULATOR
LOW PRESSURE (SUCTION) HOSE
LOW PRESSURE CHARGING VALVE
NITROGEN CYLINDER

Figure 5-5. Nitrogen Tank Connection

5-12. PURGING THE REFRIGERANT SYSTEM.-Continued

Assuming that the system has been discharged using a manifold as described in paragraph 5-11 proceed as follows:

a. See specific component removal instructions. On models F18H-3S and F18H-1S it may be necessary to remove top rear cover prior to connecting hoses to service valves.

b. Be sure that refrigerant has been discharged. (See para 5-11.)

c. Connect center hose from charging manifold to a nitrogen regulator and dry nitrogen bottle.

d. The hose from the high pressure charging valve to the charging manifold should be connected.

e. The hose from the low pressure charging valve should be disconnected from the charging manifold.

f. Open both charging valves on unit.

g. Close the unused valve on the charging manifold and open the one connected to the high pressure hose.

h. Open the nitrogen cylinder valve and adjust the regulator so that approximately 1 - 2 cfm (0.028 - 0.057 m^3/minute) of nitrogen flows through the system.

i. Check discharge from hose attached to the low pressure charging valve to be sure that no oil is being forced out of the system.

j. Allow nitrogen to flow through the system at the rate of 1 - 2 cfm (0.028 - 0.057 m^3/minute) for a minimum of 5 minutes before starting any brazing operation, then allow it to continue to flow at the same rate until all brazing operations are completed.

k. After installation brazing operations are completed, allow nitrogen to flow for a minimum of 5 minutes.

l. Close nitrogen cylinder valve, nitrogen regulator, charging manifold valve, and both high and low pressure charging valves on the unit.

m. Disconnect hose from nitrogen tank.

n. Assuming that all repairs are completed, go to paragraph 5-14.

5-13. BRAZING/DEBRAZING PROCEDURES.

Supplies: Brazing alloy (silver) (items 9 and 10, Appendix E)
Nitrogen cylinder (item 8, Appendix E)
Brazing flux (item 11, Appendix E)
Abrasive cloth (item 12, Appendix E)
Rags (item 13, Appendix E)

a. General. All tubing in the refrigeration system is seamless copper with a bright internal finish that permits thorough cleaning and prevents entrapment of moisture or other impurities. Rigid grade copper is used for straight sections and soft grade for sections that must be bent. All interconnecting fittings, such as elbows, tees, etc., are also copper. The bodies of all valves and all connectors on other components are brass. All joints, except those provided with flare fittings, are made by brazing in accordance with MIL-B-7883, except that radiographic examination is not required.

b. Filler Alloy. Grade IV or VI brazing alloy and Type B flux, as specified in MIL-B-7883, must be used for all copper to brass joints. Grade III brazing alloy may be substituted for Grade IV or VI for copper to copper joints; flux is not required for copper to copper joints.

c. Debrazing. Debraze joints for removal of refrigeration system components as follows:

WARNING

All Refrigerant - 22 must be discharged from the system and the entire system must be purged with dry nitrogen before beginning any debrazing operation.

(1) Determine which joints are to be debrazed. Due to limited work space inside the air conditioner, it may be more convenient to remove a part of the interconnecting tubing with the component rather than debrazing joints on the component itself.

(2) Before debrazing a joint on a valve, disassemble the valve to the extent possible, then wrap all but the joint with a wet cloth to act as a heat sink.

WARNING

The polyurethane foam used as insulation in the air conditioner will break down to form toxic gases if exposed to the flame of a torch or brazing temperature.

5-13. BRAZING/DEBRAZING PROCEDURES.-Continued

(3) Protect insulation, wiring harnesses, and other components with appropriate shields.

(4) Be sure the work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of 1 - 2 cfm (0.028 - 0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly melt the filler alloy. If heat is applied slowly, or only on one side, the entire component or length of tubing will be heated and filler alloy in adjacent joints may also be melted. Remove heat as soon as the joint separates.

d. Cleaning Debrazed Joints. All filler alloy must be cleaned from debrazed joints before reassembly. Heat each piece of the joint until the filler alloy is melted and then wipe it away with a damp cloth. Be sure no filler alloy or other debris is left inside any tubing, fitting, or component.

e. Reassembly. If tubing sections or fittings were removed with a component, debraze them from the component, clean the joints, and braze them to the new components before reinstallation.

f. Brazing. Braze joints within the air conditioner as follows:

(1) Position component to be installed.

(2) To prepare for brazing a joint on a valve, disassemble valve to the extent possible, then wrap all but the joint with a wet cloth to act as a heat sink.

(3) Protect insulation, wiring harnesses, and surrounding components with appropriate shields.

(4) Be sure work area is well ventilated and that dry nitrogen is flowing through the refrigeration system at a rate of 1 - 2 cfm (0.028 - 0.057 m^3/minute).

(5) Apply sufficient heat uniformly around the joint to quickly raise it to a temperature that will melt the filler alloy. Remove heat as soon as brazing is completed.

5-14. LEAK TESTING.

Supplies: Nitrogen cylinder (item 8, Appendix E)
Refrigerant-22 (item 4, Appendix E)

The entire refrigeration system should be thoroughly leak tested after repair or replacement of any component, before it is recharged with Refrigerant-22. Leak testing is also the method for troubleshooting when a system has lost all or part of its refrigerant charge through an undetermined cause.

a. Disassembly.

NOTE

The following steps cover all the disassembly actions necessary to prepare a system for complete leak testing. If the air conditioner has been partially disassembled for repair, most of these actions will already have been accomplished.

(1) Disconnect power at power source.

(2) Remove top covers. (See para 4-11.)

(3) Remove supply air louver. (See para 4-14.)

(4) Remove mist eliminator. (See para 4-16.)

b. Testing Method. There are two acceptable methods for leak testing the refrigeration system.

(1) Refrigerant Gas Leak Detector. If an electronic refrigerant gas leak detector is available it should be used in accordance with the procedures contained in TM 9-4940-435-14, "Leak Detector, Refrigerant Gas".

NOTE

The electronic refrigerant gas tester is highly sensitive to the presence of a small quantity of gas in the air, and due to this fact it is quite effective in the detection of small leaks. However, due to the rapid dispersion of refrigerant gas into the surrounding air, difficulty may be encountered in pinpointing large leaks. The detector must be used in a well ventilated but draft-free area.

(2) Soap Solutions. In this method, a strong solution of a liquid detergent and water is brushed onto all points of possible leakage while closely observing for the formation of bubbles.

5-14. LEAK TESTING.-Continued

CAUTION

If the soap solution testing method is used, thoroughly rinse with fresh water after testing is completed. A residual soap film will attract and accumulate an excessive amount of dust and dirt during operation.

c. Testing Procedures. To perform leak testing by use of the electronic detector, it is necessary that the system be pressurized with a proportion of refrigerant gas. To perform leak testing by use of the soap solution method, the system may be pressurized with dry nitrogen alone.

(1) To pressurize a system that has some refrigerant charge, for either leak testing method:

(a) Connect hoses from a charging manifold to charging valves.

NOTE

If it is possible that the problem may not be a leak and that you may not have to replace a refrigeration system component, Refrigerant-22 may be substituted for nitrogen in the following test. If nitrogen is used you will have to discharge, evacuate, and recharge the system after test is completed.

(b) Connect a nitrogen pressure regulator and nitrogen bottle to center hose connection of charging manifold.

(c) Open unit charging valves and charging manifold valves.

(d) Open nitrogen tank valve and pressurize system to 350 psi (24.7 kg/cm^2).

(e) Perform leak tests.

(f) If a leak is found, discharge and purge system and repair leak. See specific instructions for component removal.

(g) If a leak was not found and Refrigerant-22 was used to pressurize system see charging instructions (para 5-16.).

5-14. LEAK TESTING.-Continued

(2) To pressurize a system that has been discharged and purged, for leak testing with an electronic detector:

(a) Connect hoses from charging manifold to charging valves.

(b) Connect drum of Refrigerant-22 to center hose connection of service manifold.

CAUTION

Connect the Refrigerant-22 drum so that only gas will be used for pressurization.

(c) Open both unit charging valves and charging manifold valves.

(d) Open refrigerant drum valve slightly and adjust as necessary to prevent formation of frost; and, allow system pressure to build up until gages read 40-50 psi (2.8 - 3.5 kg/cm^2).

(e) Close charging manifold valves and refrigerant drum valve.

(f) Remove Refrigerant-22 drum from center hose connection.

(g) Connect a cylinder of dry nitrogen to center hose connection.

(h) Open the charging manifold valves and the nitrogen cylinder valve; allow system pressure to build up until gages read 350 psi (24.7 kg/cm^2).

(i) Perform leak tests, then discharge and purge system, in accordance with paragraphs 5-11 and 5-12 before performing maintenance, or before evacuating and charging system, as appropriate.

(3) Final Leak Testing. Always perform a final leak test after performing any repair or replacement of components before the air conditioner is reassembled and the refrigeration system is evacuated and charged.

5-15. EVACUATING THE REFRIGERANT SYSTEM.

The refrigeration system must be evacuated to remove all moisture before it is charged with Refrigerant-22. (See fig. 5-6.)

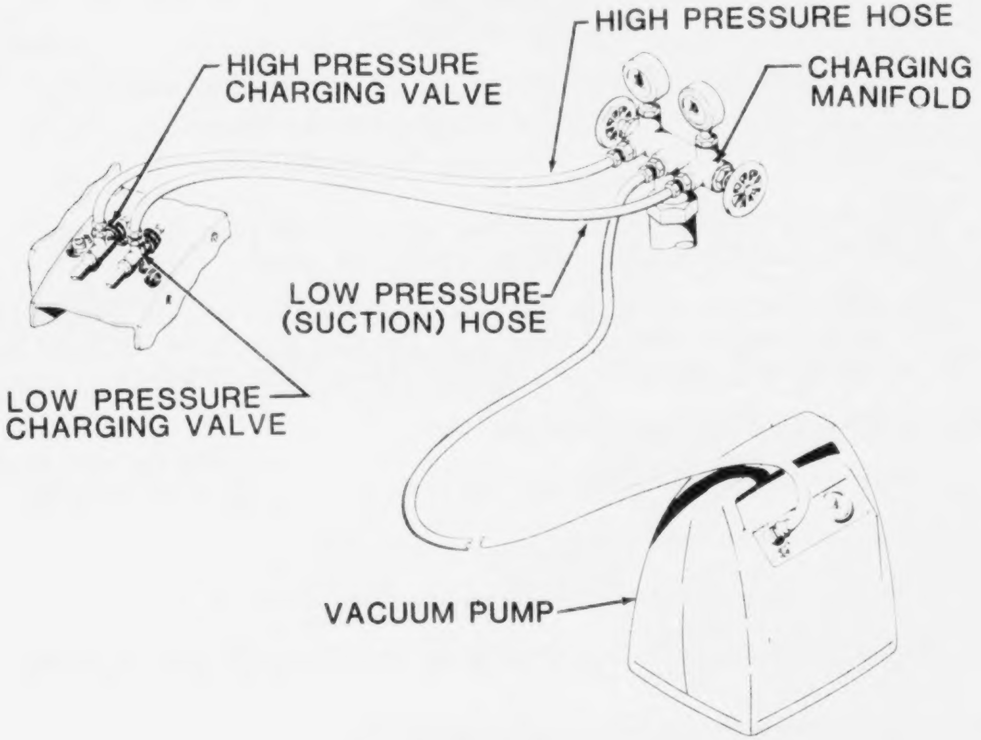
HIGH PRESSURE HOSE
HIGH PRESSURE CHARGING VALVE
CHARGING MANIFOLD
LOW PRESSURE (SUCTION) HOSE
LOW PRESSURE CHARGING VALVE
VACUUM PUMP

Figure 5-6. Evacuation of Refrigerant System

a. Check that system was leak tested and has NO LEAKS.

b. Check that new dehydrator was installed. If not, install one. (See para 5-31.)

c. Check that both charging valves and charging manifold valves are closed.

d. Attach hose assemblies to charging valves and charging manifold valves.

e. Attach center hose assembly to vacuum pump.

5-15. EVACUATING THE REFRIGERANT SYSTEM.-Continued

f. Start vacuum pump.

g. Open charging manifold valves.

h. Open both unit charging valves.

i. Run vacuum pump until at least 29 inches of mercury, measured on gage, is reached.

NOTE

Inability to reach 29 inches of mercury may indicate either a leak or a problem with the pump.

j. Continue running pump for one more hour, while observing the gage. If gage needle moves back and forth, you have a leak which must be located and corrected first. (See para 5-14.)

k. Close charging manifold valves.

l. Close both unit charging valves.

m. Stop vacuum pump.

n. Disconnect pump from center hose connection.

o. Go to paragraph 5-16, Charging the Refrigerant System.

5-16. CHARGING THE REFRIGERANT SYSTEM.

After the system has been satisfactorily evacuated, it must be fully charged with Refrigerant-22. (See fig. 5-7.)

CAUTION

Never introduce liquid refrigerant into the low pressure (suction) charging valve.

NOTE

The system must be evacuated before charging. Use only Refrigerant-22 to charge the unit.

a. On models F18H-3S and F18H-1S the charging operation should be done with all covers in place except for refrigerant charging valve access cover.

5-16. CHARGING THE REFRIGERANT SYSTEM.-Continued

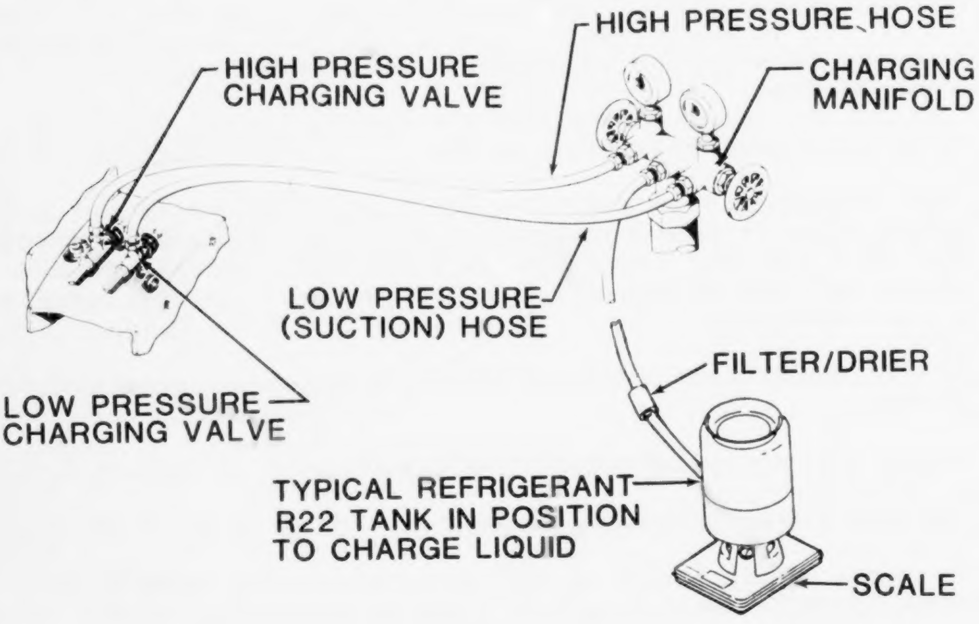
HIGH PRESSURE HOSE
HIGH PRESSURE CHARGING VALVE
CHARGING MANIFOLD
LOW PRESSURE (SUCTION) HOSE
FILTER/DRIER
LOW PRESSURE CHARGING VALVE
TYPICAL REFRIGERANT R22 TANK IN POSITION TO CHARGE LIQUID
SCALE

Figure 5-7. Refrigerant Charging

b. Check that the hose from the low pressure charging valve is connected to the compound gage side of the charging manifold. The hose from the high pressure charging valve should be connected to the pressure gage side of the charging manifold.

c. Connect center hose from charging manifold to a well charged drum of Refrigerant-22.

d. Loosen hose connections to the two air conditioner charging valves slightly.

e. Open the two charging manifold valves.

f. Open Refrigerant-22 tank valve slightly to allow a small amount of refrigerant to purge air from hoses. Tighten hose connections at the air conditioner charging valves.

5-16. CHARGING THE REFRIGERANT SYSTEM.-Continued

g. Close low pressure (suction) charging manifold valve. Never introduce liquid refrigerant into low pressure (suction) charging valve.

h. Position Refrigerant-22 tank so that liquid will be used for charging. (Some drums must be inverted and some are equipped with a selector valve.)

i. Use accurate scales to measure and record weight of Refrigerant-22 drum.

j. Open Refrigerant-22 drum valve.

k. Open high pressure charging valve on air conditioner. Allow liquid refrigerant to enter system until drum weight has decreased by 3.6 pounds (1.63 Kg) for units with Carrier compressors and 2.8 pounds (1.27 Kg) for units with Keco compressors or until system pressure has equalized.

l. Close refrigerant drum valve and high pressure (discharge) manifold valve.

m. Reset low pressure cut out switch.

n. Connect power at power source.

o. Turn air conditioner on and operate in cool mode with TEMPERATURE SELECTOR set at maximum COOLER position.

p. If 3.6 pounds (1.63 Kg) for units with Carrier compressors and 2.8 pounds (1.27 Kg) for units with Keco compressors full charge was obtained, skip steps q. through s. If system pressure equalized prior to obtaining a full charge of 3.6 pounds (1.63 Kg) for units with Carrier compressors and 2.8 pounds (1.27 Kg) for units with Keco compressors proceed with step q.

q. Switch refrigerant drum to gas only position.

r. Be sure refrigerant drum has been switched to gas position and open refrigerant drum valve, low (suction) pressure charging manifold valve and low (suction) pressure charging valve on air conditioner.

s. Monitor weight of the refrigerant drum as air conditioner compressor pulls additional refrigerant gas into system until full 3.6 pounds (1.63 Kg) for units with Carrier compressors and 2.8 pounds (1.27 Kg) for units with Keco compressors charge is obtained. When system is fully charged, immediately close refrigerant drum valve and air conditioner low pressure charging valve.

t. Run air conditioner in COOL mode (with temperature control in coolest position) for 15 minutes.

5-16. CHARGING THE REFRIGERANT SYSTEM.-Continued

CAUTION

Do not skip the next step.

u. After 15 minutes, observe sight glass on back of condenser section. Be sure that the refrigeration system is not in bypass. When system goes into bypass bubbles will appear in the sight glass.

- Green center means refrigerant moisture content is acceptable.
- Yellow center means there is too much moisture in system. It must be discharged, evacuated, and charged again.
- Milky white or bubbly liquid means system has a low charge.
- Clean bubble-free liquid around center means the system is fully charged.

v. If charge is low add gas refrigerant.

(1) Be sure drum is switched to gas position. Open drum valve.

(2) Continue to charge until sight glass is clean and bubble-free.

(3) Close low pressure air conditioner charging valve and refrigerant drum valve.

w. Turn MODE SELECTOR switch to OFF.

x. Check that high and low pressure air conditioner charging valves are closed and remove charging manifold hoses.

y. On models F18H-3S and F18H-1S install charging valve access cover and secure with four screws. On all other models install top cover (see para 4-11).

5-17. REFRIGERATION SYSTEM TROUBLESHOOTING.

The two most likely malfunction symptoms to be reported to direct support maintenance are: (1) Unsatisfactory color or bubbles observed in the sight glass; and (2) reduced cooling capacity. Discussion with operators and/or organizational maintenance personnel as to how the symptoms appeared can often be more informative than the symptoms themselves.

a. Sight Glass Indications. There are two indications that may be observed in the sight glass; (1) color as a result of moisture content in the refrigerant, and (2) vapor bubbles in the liquid refrigerant.

(1) Color Change. A bright green color indicates that the refrigerant is dry. As moisture content increases, the color will gradually change from chartreuse until it reaches pure yellow. A gradual change from green into chartreuse over an extended period of time is normally an indication that the dehydrator is becoming saturated with moisture. A sudden change of color is highly unlikely unless a rupture occurs allowing all refrigerant to escape.

(2) Bubbles. The appearance of an occasional bubble in the sight glass can be expected, especially when operating in a high ambient temperature. A gradual increase in the number and frequency of bubbles is usually an indication that the refrigerant charge is being lost from the system through a small leak. The number and frequency of bubbles will also increase if the refrigeration system becomes overheated. The sudden appearance of numerous bubbles is usually an indication of a serious leak.

NOTE

When the system goes into bypass numerous bubbles will appear. This is normal. Be sure that the refrigeration system is under full load when observing the sight glass for refrigerant condition.

b. Reduction in Cooling Capacity. A reduction in cooling capacity will occur as a natural result if refrigerant is lost from the system; with a total loss of cooling if all refrigerant is lost. However, in some conditions a considerable proportion of the refrigerant may be lost before the reduced cooling capacity is noticeable. Sudden or erratic reduction, or complete loss of cooling capacity is often caused by the malfunction of one of the valves in the refrigeration system. Cooling capacity will also be reduced if the refrigeration system becomes overheated.

5-18. OVERHEATING CHECKS.

Overheating of the refrigeration system is often the cause of bubbles appearing in the sight glass, or a reduction in cooling capacity. Adequate cooling of the hot, compressed refrigerant vapor in the condenser is essential to the proper operation of the air conditioner. The following checks should be made to ensure that overheating is not the cause of the symptoms before troubleshooting the pressurized portion of the refrigeration system:

a. Be sure there is no external obstruction to air flow into the condenser intake screen and out of the condenser fan guard.

b. Be sure there is no obstruction within the intake screen and fan guard.

c. Be sure there are no obstructions or an excessive build-up of dust and dirt in the condenser coil.

5-19. REFRIGERANT PRESSURE CHECK.

Except in cases where it is obvious that the refrigerant charge has been lost, the first step in troubleshooting problems in the refrigeration system should be to check discharge and suction pressures under operating conditions. Check pressures as follows:

a. Turn MODE SELECTOR switch to OFF.

b. On models F18H-3S and F18H-1S remove charging valve access cover. On all other models remove top cover (see para 4-11).

c. Connect individual pressure gages or a refrigeration servicing manifold and hoses to high (discharge) and low (suction) charging (service) valves.

CAUTION

> Take care that only a very small amount of refrigerant is allowed to escape during hose purging.

d. Loosen hose connections at gages or charging manifold.

e. Open high (discharge) pressure service valve slightly to purge air from hose. Tighten high pressure hose connection at gage fitting as soon as a hissing sound is heard.

5-19. REFRIGERANT PRESSURE CHECK.-Continued

e. Open high (discharge) pressure service valve slightly to purge air from hose. Tighten high pressure hose connection at gage fitting as soon as a hissing sound is heard.

f. Open low (suction) pressure service valve slightly to purge air from hose. Tighten low pressure hose connection at gage fitting as soon as a hissing sound is heard.

g. Open low (suction) and high (discharge) charging valves.

h. Both gages should read the same. Check the reading with the appropriate column in Table 5-2. If the system is even partially charged, the pressure should be approximately equal to that shown in the table for the appropriate ambient temperature. If the pressure is considerably less than shown in the table, the system does not contain enough refrigerant to continue the pressure check; proceed directly to leak testing. (See para 5-14.)

i. Turn air conditioner on and operate in COOL mode with TEMPERATURE SELECTOR in full COOLER setting for a few minutes.

j. With unit operating allow gages to stabilize. Take readings of the two gages.

(1) If discharge and suction pressures are at, or near, the same value, a pressure equalizer solenoid valve L2 malfunction, or an internal compressor failure is indicated.

Table 5-2. PRESSURE-TEMPERATURE RELATIONSHIP OF SATURATED REFRIGERANT-22

Temperature		Pressure		Temperature		Pressure	
Deg F	Deg C	Psig	kg/cm^2	Deg F	Deg C	Psig	kg/cm^2
10	-12.3	32.93	2.315	66	18.9	114.2	8.029
12	-11.1	34.68	2.439	68	20.0	118.3	8.318
14	-10.0	36.89	2.593	70	21.1	122.5	8.612
16	- 8.9	38.96	2.739	72	22.2	126.8	8.915
18	- 7.8	41.09	2.889	74	23.3	131.2	9.225
20	- 6.6	43.28	3.043	76	24.4	135.7	9.541
22	- 5.5	45.23	3.180	78	25.6	140.3	9.864
24	- 4.3	47.85	3.364	80	26.7	145.0	10.195
26	- 3.4	50.24	3.532	82	27.8	149.8	10.522
28	- 2.2	52.70	3.705	84	28.9	154.7	10.877
30	- 1.1	55.23	3.883	86	30.0	159.8	11.236
32	0	57.83	4.066	88	31.1	164.9	11.594
34	1.1	60.51	4.254	90	32.2	170.1	11.960
36	2.2	63.27	4.448	92	33.3	175.4	12.332
38	3.3	66.11	4.648	94	34.5	180.9	12.719
40	4.4	69.02	4.853	96	35.6	186.5	13.113
42	5.5	71.99	5.062	98	36.7	192.1	13.506
44	6.6	75.04	5.276	100	37.8	197.9	13.914
46	7.7	78.18	5.497	102	38.9	203.8	14.329
48	8.8	81.40	5.723	104	40.0	209.9	14.758
50	10.0	84.70	5.955	106	41.1	216.0	15.187
52	11.1	88.10	6.257	108	42.2	222.3	15.630
54	12.2	91.5	6.433	110	43.3	228.7	16.080
56	13.3	95.1	6.686	112	44.4	235.2	16.537
58	14.5	98.8	6.947	114	45.6	241.9	17.008
60	15.6	102.5	7.206	116	46.7	248.7	17.486
62	16.7	106.3	7.474	118	47.8	255.6	17.971
64	17.8	110.2	7.748				

5-19. REFRIGERANT PRESSURE CHECK.-Continued

(2) If discharge pressure is low and suction pressure is normal (see Table 5-3) a low refrigerant charge is indicated.

Table 5-3. NORMAL OPERATING PRESSURES

Temperatures	**Pressure Range (psig)**			
Outdoor Ambient	**50°F(10°C)**	**75°F(24°C)**	**100°F(38°C)**	**125°F(51.7°C)**
90°F(32°C) Return Air to Unit (Dry Bulb)	55-65 Suction 190-210 Discharge	60-70 Suction 220-240 Discharge	65-75 Suction 305-325 Discharge	78-88 Suction 410-430 Discharge
80°F(27°C) Return Air to Unit (Dry Bulb)	53-63 Suction 180-200 Discharge	55-65 Suction 210-230 Discharge	60-70 Suction 295-315 Discharge	70-80 Suction 395-415 Discharge

(3) If discharge pressure is normal and suction pressure is either high or low, failure or maladjustment of the pressure regulator valve is indicated.

(4) If discharge pressure is high and suction pressure is normal, a malfunction of quench valve is indicated.

k. When pressure tests are completed, proceed with the maintenance action indicated.

5-20. EVAPORATOR COIL.

The evaporator coil is located in the upper right front section of the air conditioner. (See fig. 5-8.) For inspection and service instructions see paragraph 4-36.

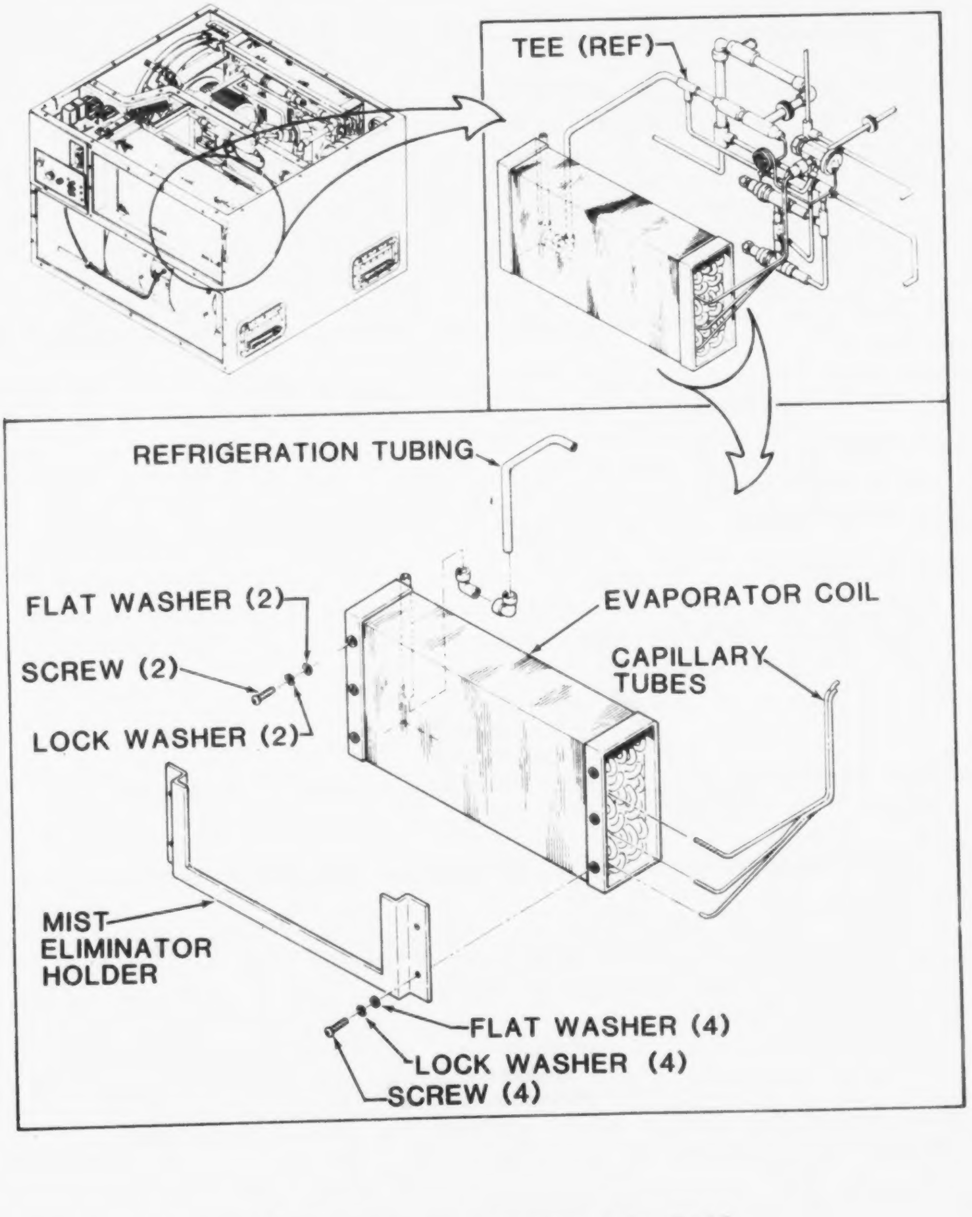
TEE (REF)
REFRIGERATION TUBING
FLAT WASHER (2)
SCREW (2)
LOCK WASHER (2)
EVAPORATOR COIL
CAPILLARY TUBES
MIST ELIMINATOR HOLDER
FLAT WASHER (4)
LOCK WASHER (4)
SCREW (4)

Figure 5-8. Evaporator Coil

5-20. EVAPORATOR COIL.-Continued

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Remove supply air louver (para 4-14).

(4) Remove mist eliminator by lifting out of unit.

(5) Discharge and purge the refrigerant system per paragraphs 5-11 and 5-12.

(6) Unwrap insulation on joints to be debrazed.

(7) Debraze tube connections at tee and expansion valve (para 5-13). Take care that expansion valve is not damaged during debrazing operations.

(8) Remove top two pan head screws, lock washers, and flat washers that attach coil to housing. Remove four each screws, lock washers, and flat washers that attach the mist eliminator holder and coil to the housing.

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage on the coil.

(9) Slip evaporator coil and mist eliminator holder up and out of unit.

b. Replace. If coil is defective replace it.

c. Installation.

WARNING

When handling coils wear gloves to avoid cuts and reduce fin damage on the coil.

(1) Carefully position evaporator coil and mist eliminator holder.

5-20. EVAPORATOR COIL.-Continued

(2) Secure mist eliminator holder and evaporator coil to housing with four pan head screws, lock washers, and flat washers. Secure evaporator coil to housing with twc each screws, lock washers, and flat washers. The four holes in the mist eliminator holder match the bottom four holes in the coil.

(3) Align tubing connections to tee and expansion valve. Braze joints in accordance with paragraph 5-13. Take care that expansion valve is protected during brazing operation.

(4) Replace dehydrator. (See para 5-30.)

(5) Leak test coil, dehydrator, newly brazed joints, and joints in the area of newly brazed joints per paragraph 5-14.

(6) Rewrap insulation that was removed prior to debrazing.

(7) Slide mist eliminator into its holder. TOP mark must be up and air flow arrows must point away from coil.

(8) (Models F18H-3S and F18H-1S) Install supply air louver and top front cover (para 4-14 and 4-11). (Models F18H-3SA and F18H-3SB) Install supply air louver and top cover (para 4-14 and 4-11).

(9) Evacuate and charge refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-21. FLUID FLOW RESTRICTOR.

The fluid flow restrictor is located in the upper right front section of the air conditioner. (See fig. 5-9.)

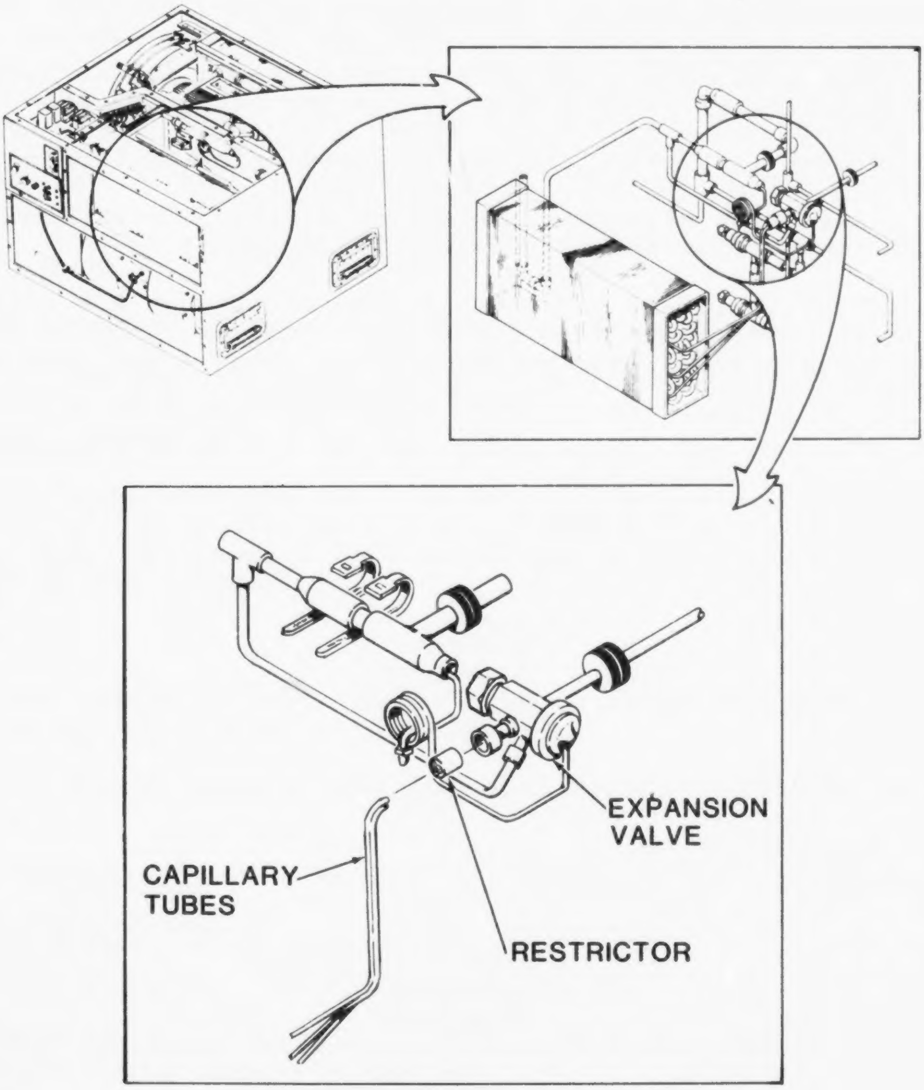
EXPANSION VALVE
CAPILLARY TUBES
RESTRICTOR

Figure 5-9. Fluid Flow Restrictor

5-21. FLUID FLOW RESTRICTOR.-Continued

a. Removal.

WARNING

Disconnect input power from the air conditioner before performing maintenance on any part of the electrical system. The voltages used can be lethal.

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge the refrigerant system per paragraphs 5-11 and 5-12.

(4) Unwrap insulation on joints to be debrazed.

(5) Debraze restrictor at expansion valve and evaporator coil capillary tubes. See paragraph 5-13. Take care that expansion valve is not damaged during debrazing operations.

b. Replace. If restrictor is suspected bad replace it.

c. Installation.

(1) Carefully place restrictor in position between expansion valve and evaporator coil tubing.

(2) Braze restrictor to expansion valve in accordance with paragraph 5-13.

(3) Braze capillary tubes to restrictor.

(4) Replace dehydrator. (See para 5-31.)

(5) Perform leak test per paragraph 5-14.

(6) Rewrap insulation that was removed prior to debrazing.

(7) (Models F18H-3S and F18H-1S) Install top front cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(8) Evacuate and charge refrigeration system in accordance with paragraph 5-15 and 5-16.

5-22. EXPANSION VALVE (PRIMARY).

The (primary) expansion valve is factory set at a superheat temperature of 6 ± 1/2°F (3.3 ± 0.3°C) at 32°F (0°C) bath temperature. Do not attempt field adjustment of the valve.

a. Removal. (See fig. 5-10.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Unwrap insulation from joints of expansion valve.

(5) Soften thermal mastic in the bulb well using a cloth wrung out in hot water, a heat lamp, or heat gun if necessary and withdraw bulb from bulb well.

(6) Debraze two tube connections and restrictor connection to valve.

(7) Remove valve from unit.

b. Replace. If expansion valve is suspected bad replace it.

c. Installation.

(1) Place expansion valve in unit and align tubing ends.

(2) Protect valve from overheating during brazing operations. Direct flame away from valve body and wrap valve body with wet rags.

(3) Braze joints in accordance with paragraph 5-13.

(4) Replace dehydrator. (See para 5-31.)

(5) Leak test all newly connected joints and all tube connections in the area. (See para 5-14.)

(6) Rewrap insulation at expansion valve joints.

(7) Install sensing bulb in bulb well.

(a) Insert approximately one ounce of thermal mastic in bulb well.

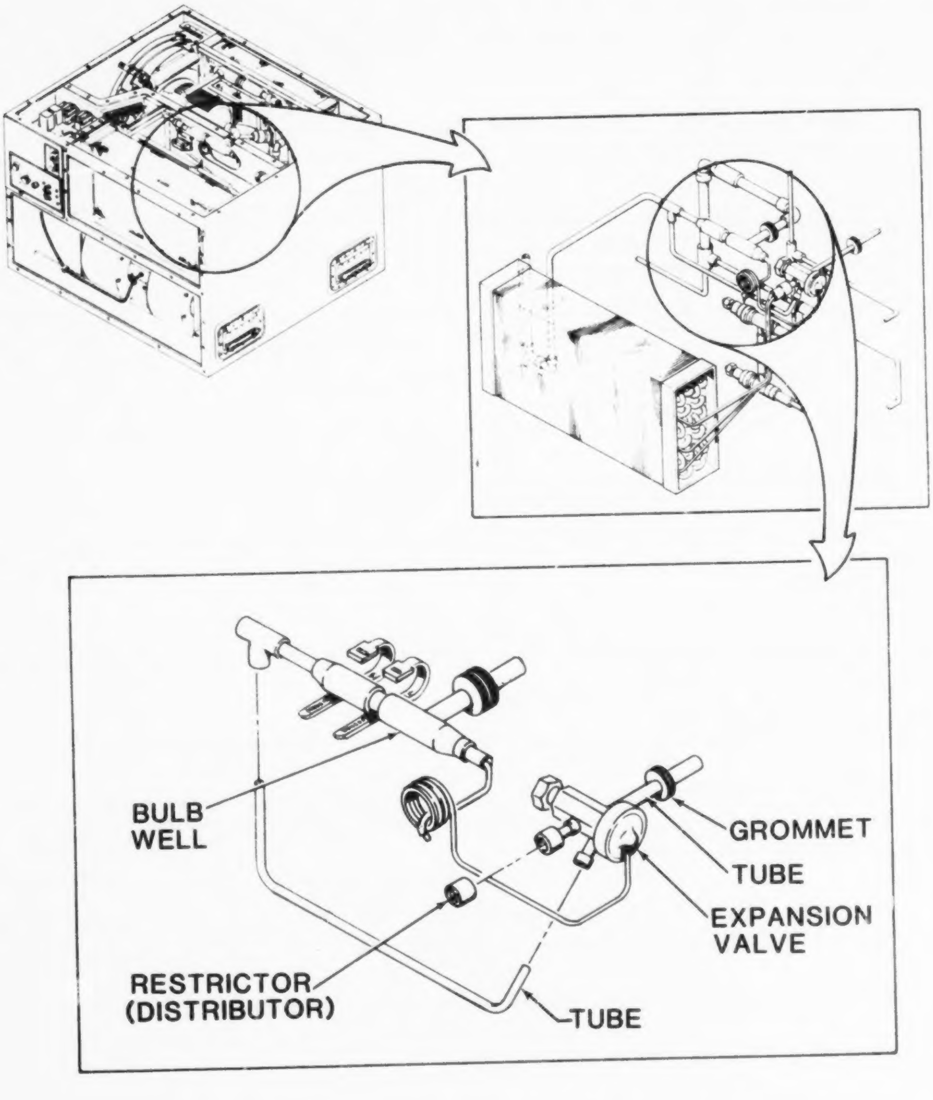
BULB
WELL
GROMMET
TUBE
EXPANSION
VALVE
RESTRICTOR
(DISTRIBUTOR)
TUBE

Figure 5-10. Expansion Valve (Primary)

5-22. EXPANSION VALVE (PRIMARY).-Continued

(b) Insert sensing bulb from expansion valve into bulb well.

(c) Move bulb back and forth to distribute the mastic.

(d) Set bulb about one inch (2.5 cm) beyond open end of bulb well.

(8) (Models F18H-3S and F18H-1S) Install three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-23. EXPANSION VALVE (QUENCH).

The liquid quench expansion valve is factory set at a superheat of 16 $\pm 1/2^{\circ}$F (8.9 $\pm 0.3^{\circ}$C) at 32°F (0°C) bath temperature. Do not attempt field adjustment of this valve.

a. Removal. (See fig. 5-11.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Unwrap insulation from joints of the expansion valve.

(5) Soften the thermal mastic in bulb well using a cloth wrung out in hot water, a heat lamp, or heat gun if necessary and withdraw the bulb from the well.

(6) Debraze two tube connections to valve. If flush bushing is to be reused, remove it from old valve.

(7) Remove two screws, post spacers, brackets, and lock nuts.

(8) Remove valve from the unit.

b. Replace. If expansion valve is suspected bad replace it.

c. Installation.

(1) Install flush bushing in valve.

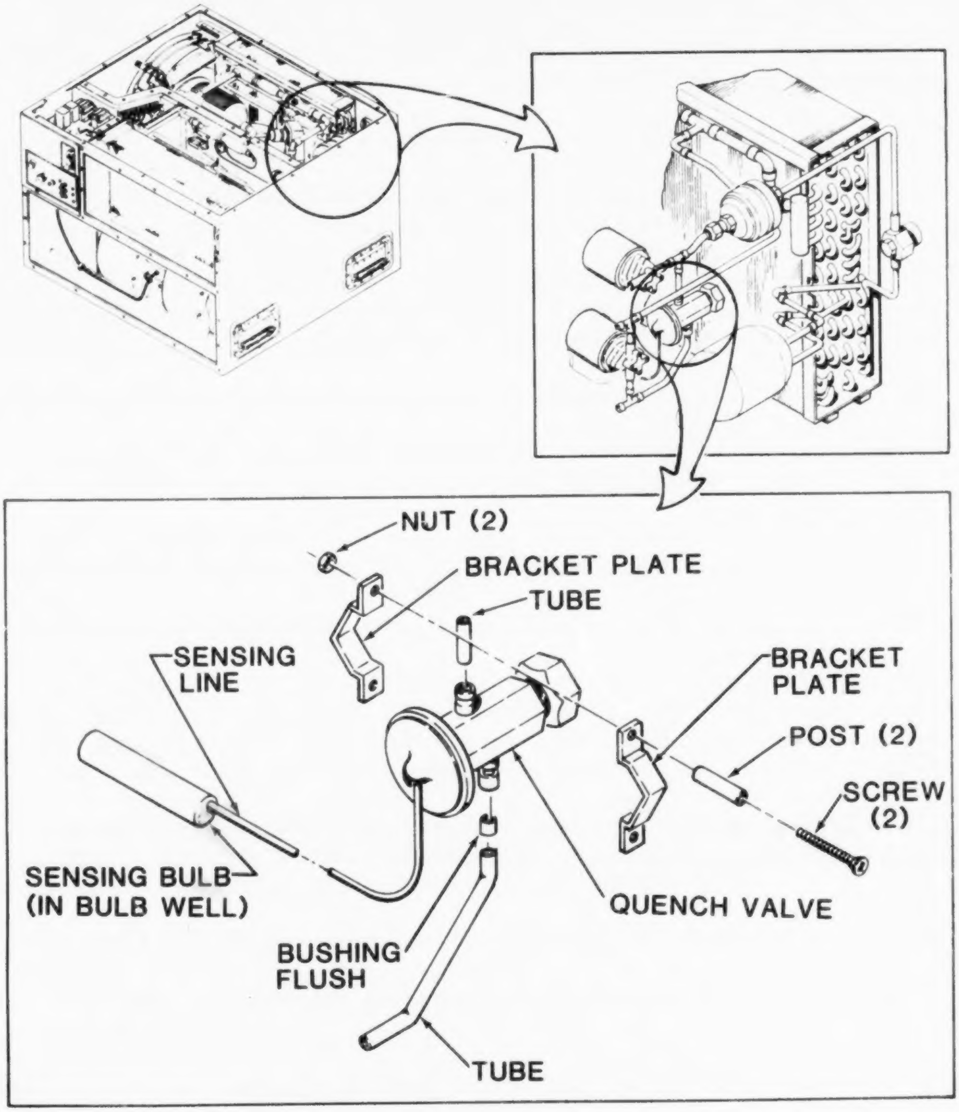
NUT (2)
BRACKET PLATE
TUBE
SENSING LINE
BRACKET PLATE
POST (2)
SCREW (2)
SENSING BULB (IN BULB WELL)
QUENCH VALVE
BUSHING FLUSH
TUBE

Figure 5-11. Expansion Valve (Quench)

5-23. EXPANSION VALVE (QUENCH).-Continued

(2) Place expansion valve in unit and align tubing ends.

(3) Protect valve from overheating during brazing operations. Direct flame away from valve body and wrap valve body with wet rag.

(4) Braze joints in accordance with paragraph 5-13.

(5) Secure valve to housing with two each screws, post spacers, brackets, and lock nuts.

(6) Replace dehydrator. (See para 5-31.)

(7) Leak test all newly connected joints and all tube connections in the area. (See para 5-14.)

(8) Rewrap insulation at expansion valve joints.

(9) Install sensing bulb in bulb well.

- (a) Insert approximately one ounce of thermal mastic in bulb well.
- (b) Insert sensing bulb from the expansion valve into bulb well.
- (c) Move bulb back and forth to distribute the mastic.
- (d) Set bulb about one inch (2.5 cm) beyond open end of bulb well.

(10) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(11) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-24. SOLENOID VALVES.

See paragraph 4-37 for testing and solenoid coil replacement.

a. Removal. (See fig. 5-12.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

NOTE

If only the coil is bad, it can be replaced without breaking into the refrigeration system. (See para 4-37.)

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Disconnect connector plug.

(5) Remove top nut that attaches coil to valve body and remove data plate, coil, and connector assembly.

(6) Cut plastic tie down straps as necessary to remove solenoid valve cable.

(7) If connector plug is to be reused unsolder it from leads.

(8) If grommet is to be reused remove it from old coil assembly.

(9) Be sure that refrigerant has been discharged.

(10) Remove two screws that attach tube and plunger assembly to valve body. Remove tube and plunger assembly, and then all other removable internal components from valve body.

(11) Remove hardware that attaches valve body to the housing.

(12) Debraze joints of refrigerant tubing from valve body and remove valve body.

b. Replace. If solenoid valve is suspected bad replace it.

c. Installation.

(1) Disassemble all removable components from new valve.

(2) Install flush bushings in valve body. Be sure dry nitrogen is flowing through system, then position valve body and braze joints of refrigerant tubing to valve body.

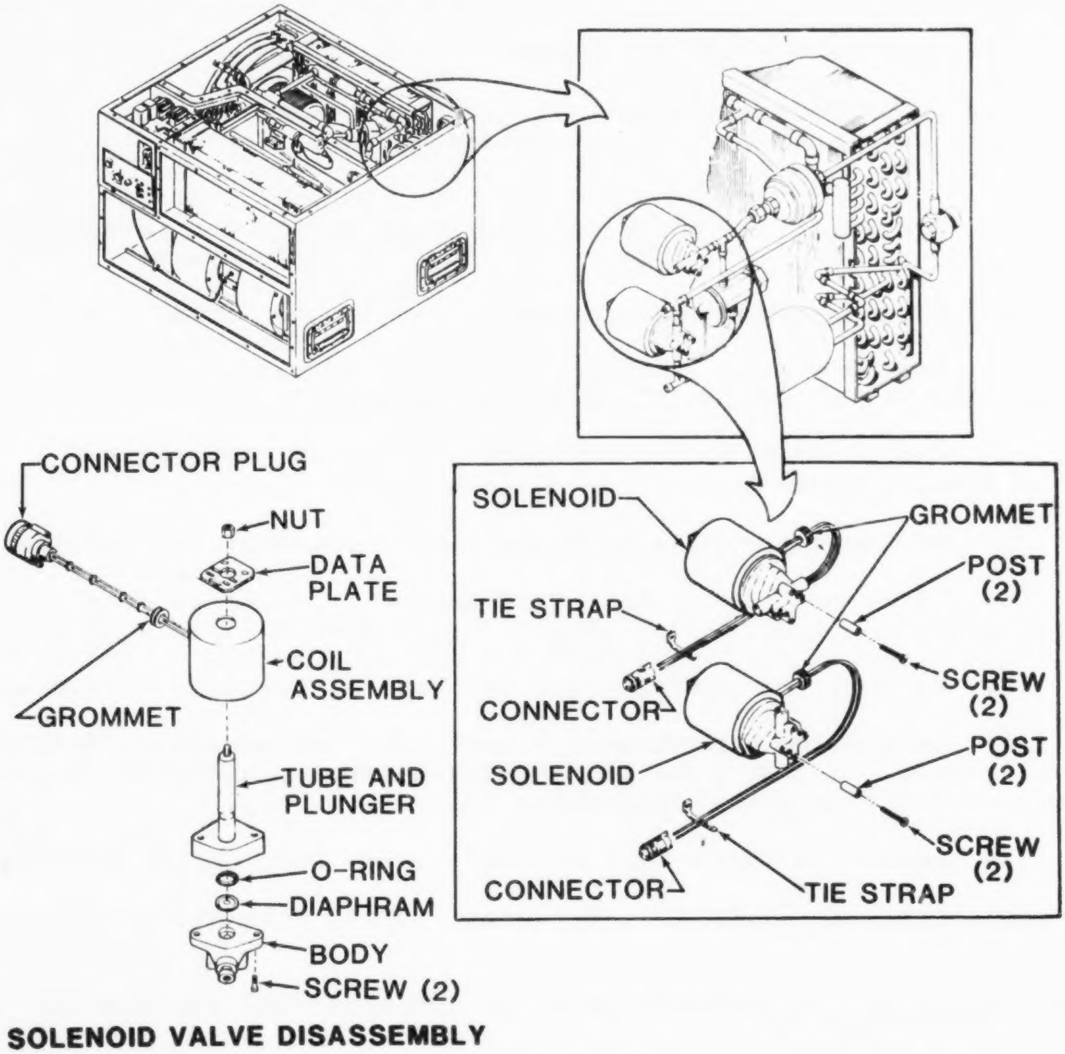
CONNECTOR PLUG
NUT
DATA PLATE
COIL ASSEMBLY
GROMMET
TUBE AND PLUNGER
O-RING
DIAPHRAM
BODY
SCREW (2)
SOLENOID VALVE DISASSEMBLY
SOLENOID
GROMMET
POST (2)
TIE STRAP
SCREW (2)
CONNECTOR
SOLENOID
POST (2)
SCREW (2)
CONNECTOR
TIE STRAP

Figure 5-12. Solenoid Valves

5-24. SOLENOID VALVES.-Continued

(3) Secure valve body to housing with hardware and brackets shown on figure 5-12.

(4) Reassemble internal components in the valve body and install the tube and plunger assembly, and two attaching screws.

(5) Install coil and connector assembly, data plate, and attaching nut on valve body.

(6) Connect connector plug.

(7) Replace dehydrator. (See para 5-31.)

(8) Leak test all newly connected joints and all tube connections in the area.

(9) Secure wires to existing harnesses with new plastic tie down straps or lacing cord.

(10) (Models F18H-3S and F18H-1S) Install three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(11) Evacuate and charge the refrigerant system in accordance with paragraphs 5-15 and 5-16.

5-25. PRESSURE REGULATOR.

The pressure regulators are located in the rear (compressor/condenser) compartment. The pressure regulators are factory set at 68 psig and sealed so that they are not field adjustable.

a. Removal. (See fig. 5-13.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Remove screw, lock washer, clamp, and post spacer.

(5) Debraze two tube connections and remove pressure regulator.

b. Replace. If a pressure regulator is suspected bad replace it.

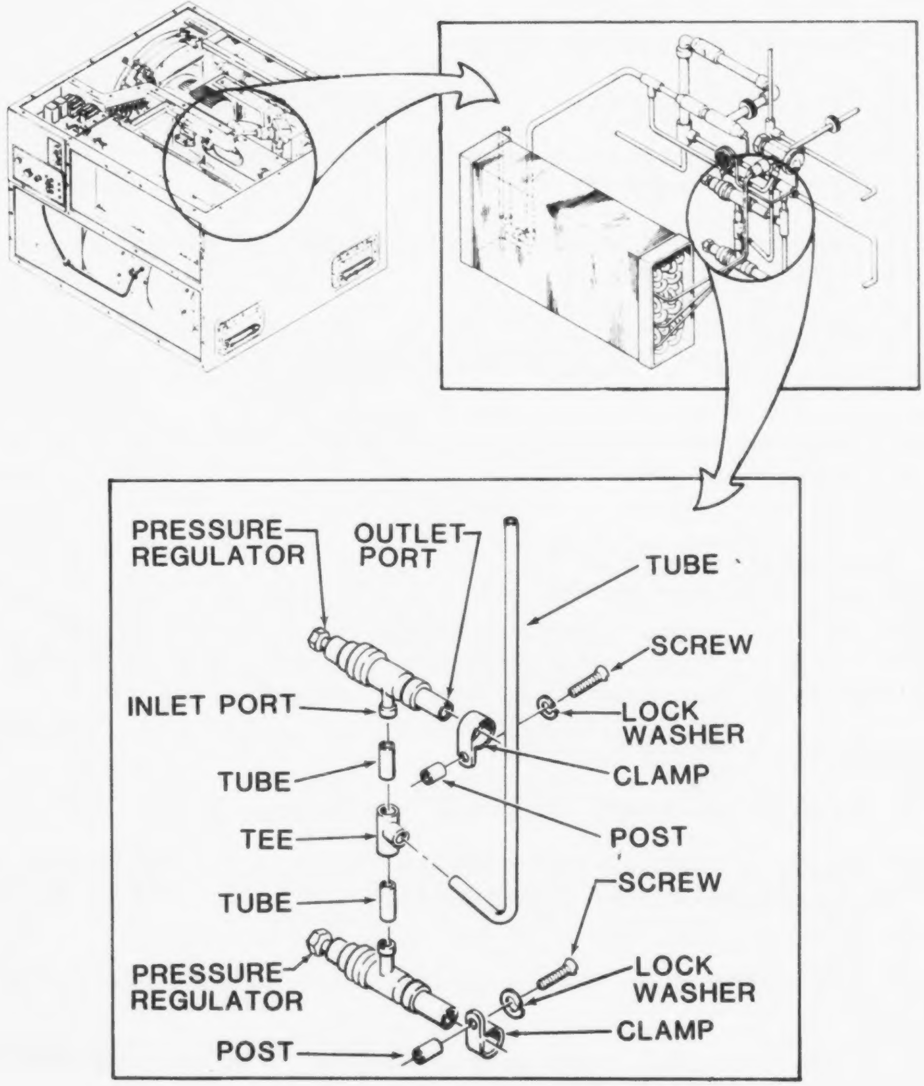
PRESSURE REGULATOR
OUTLET PORT
TUBE
SCREW
INLET PORT
LOCK WASHER
TUBE
CLAMP
TEE
POST
SCREW
TUBE
PRESSURE REGULATOR
LOCK WASHER
CLAMP
POST

Figure 5-13. Pressure Regulator

5-25. PRESSURE REGULATOR.-Continued

c. Installation.

(1) Slip pressure regulator in place.

(2) Protect pressure regulator from overheating during brazing operations. Direct flame away from valve body and wrap valve body with a wet rag.

(3) Braze two joints in accordance with paragraph 5-13.

(4) Replace dehydrator. (See para 5-31.)

(5) Leak test newly connected joints and all connections in the area.

(6) Secure pressure regulator with a screw, lock washer, clamp and post spacer.

(7) (Models F18H-3S and F18H-1S) Install three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(8) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-26. ACTUATING CYLINDER.

The actuating cylinder is located in the rear (compressor/ condenser) compartment.

a. Removal. (See fig. 5-14.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Disconnect refrigeration tubing from actuating cylinder by loosening flare nut.

(5) Loosen two screws holding pivot bracket. Remove center screw, washers, pivot arm, and bearing insert from pivot bracket.

(6) Remove two nuts and flat washers and slip actuating cylinder out of the unit.

b. Inspect/Replace. Inspect actuating cylinder for defects and broken or missing parts. Replace if defective.

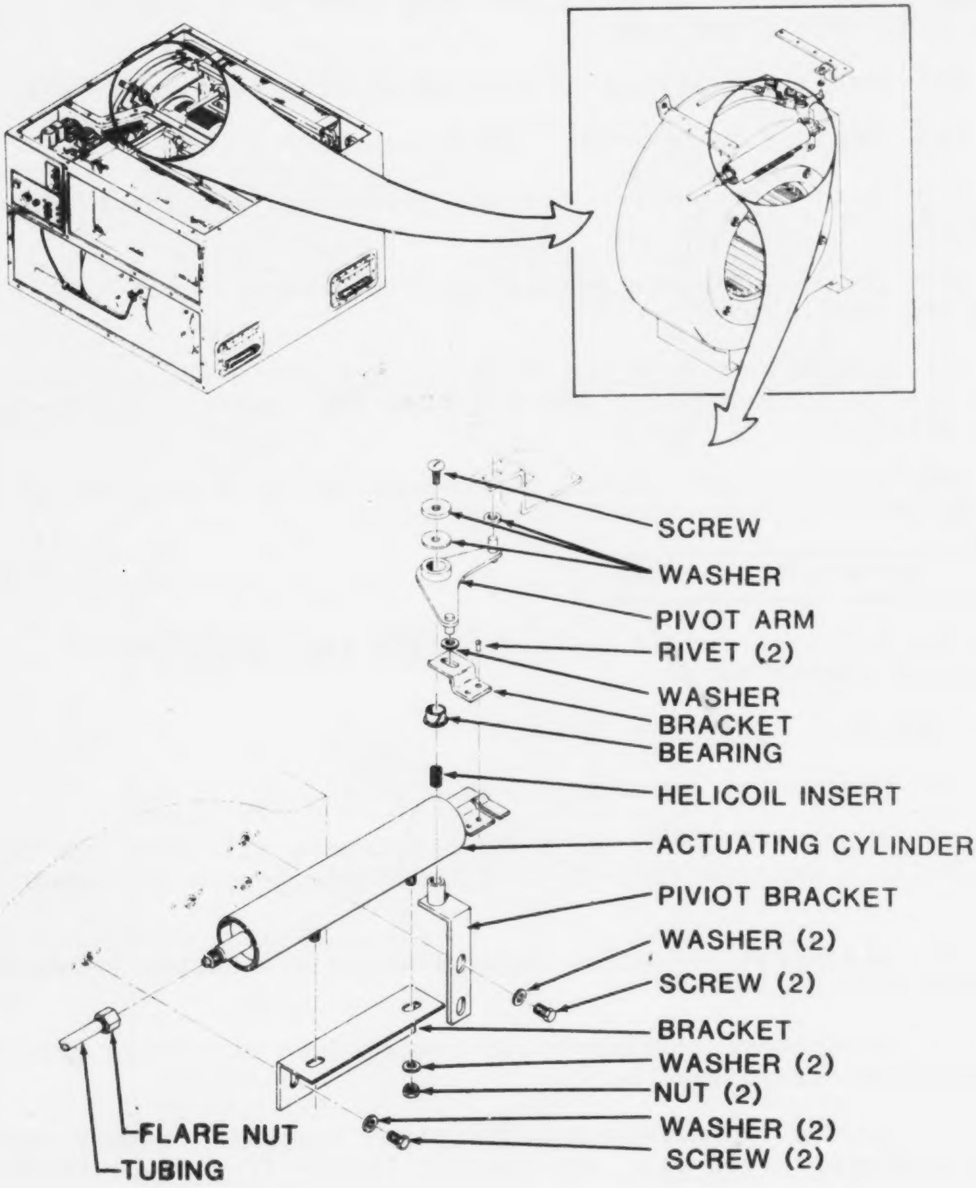
SCREW
WASHER
PIVOT ARM
RIVET (2)
WASHER
BRACKET
BEARING
HELICOIL INSERT
ACTUATING CYLINDER
PIVIOT BRACKET
WASHER (2)
SCREW (2)
BRACKET
WASHER (2)
NUT (2)
WASHER (2)
SCREW (2)
FLARE NUT
TUBING

Figure 5-14. Actuating Cylinder

5-26. ACTUATING CYLINDER.-Continued

c. Installation/Adjustment.

(1) Secure actuating cylinder to bracket with two nuts and washers. Do not tighten nuts.

(2) Install bearing insert pivot arm, washers, and screw onto pivot bracket. Tighten two bolts holding pivot bracket.

(3) Connect refrigeration tubing to actuating cylinder and tighten flare nut.

(4) Adjust condenser air discharge louver and linkage to actuating cylinder per paragraph 4-17.

(5) Replace dehydrator. (See para 5-31.)

(6) Leak test newly connected joints and all connections in the area.

(7) (Models F18H-3S F18H-1S) Install top three covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(8) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-27. PRESSURE SWITCHES.

The HIGH PRESSURE switch S4 and LOW PRESSURE switch S5 are located on the front of the unit below the control module and junction box. (See fig. 5-15.)

a. Inspect.

(1) Disconnect power at power source.

(2) Remove control module and junction box (para 4-21 and 4-26). It is not necessary to totally remove all wire connections and capillary line so long as the junction box can be pulled out enough to gain access to the pressure switches. Support the junction box so that wires and capillary line are not damaged.

(3) (Models F18H-3S and F18H-1S) Remove front and rear top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(4) Inspect pressure switches for visible signs of damage.

b. Test.

(1) Tag and disconnect wires to pressure switches.

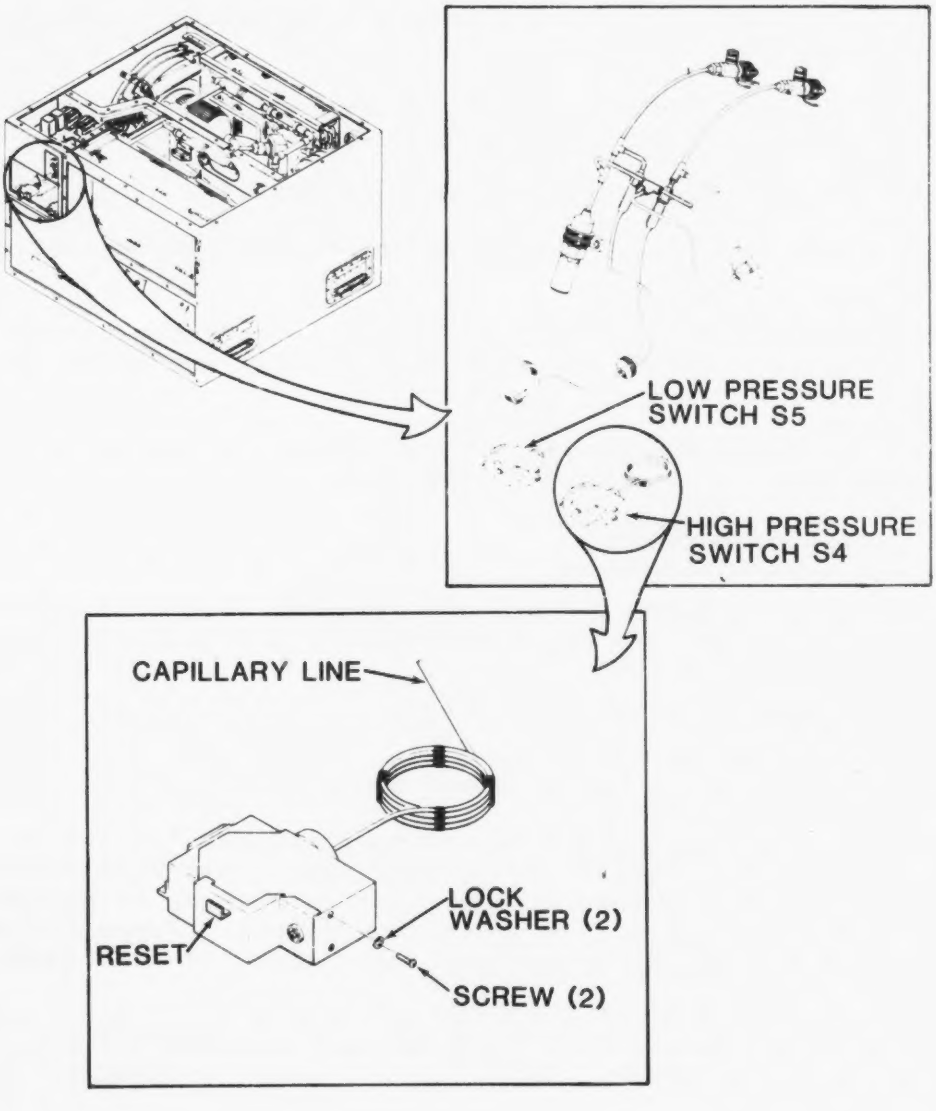
LOW PRESSURE SWITCH S5
HIGH PRESSURE SWITCH S4
CAPILLARY LINE
LOCK WASHER (2)
RESET
SCREW (2)

Figure 5-15. Pressure Switches

5-27. PRESSURE SWITCHES.-Continued

(2) Press reset button on the switch. Use a continuity tester or multimeter to check for continuity between terminals 1 and 2 on each switch. If there is continuity, the switch is properly closed. If no continuity is found on either switch, press and release the reset button again on that switch. If there is still no continuity, that switch must be replaced.

c. Removal. Assuming that steps a. (1), (2), and (3) and b. (1) above have been done proceed as follows.

(1) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(2) If HIGH PRESSURE switch is to be replaced, remove conditioned air supply louver (para 4-14) for access to mounting screws.

(3) Disconnect flare nut at end of capillary line from switch to be replaced.

(4) Remove two screws and lock washers from switch to be replaced.

(5) Carefully remove switch and capillary line.

d. Replace. Replace pressure switch found defective during inspection or test.

e. Installation.

(1) Insert capillary line through grommeted hole in bulkhead.

(2) Connect flare nut.

(3) Secure switch with two screws and lock washers.

(4) Carefully coil capillary line and position so it will not touch junction box when it is reinstalled.

(5) See tags and wiring diagram figure 4-4 and connect wire leads. Remove tags.

(6) Replace dehydrator. (See para 5-31.)

(7) Leak test newly connected joints and all connections in the area.

5-27. PRESSURE SWITCHES.-Continued

(8) Install junction box and control module (para 4-21 and 4-26).

(9) Install conditioned air supply louver (para 4-14) if it was removed.

(10) (Models F18H-3S and F18H-1S) Install top front and rear covers (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(11) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-28. SERVICE (CHARGING) VALVES.

The service (charging) valves are located in the rear (compressor/condenser) compartment.

a. Removal. (See fig. 5-16.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Remove screw, lock washer, flat washer, and loop clamp from the valve to be replaced.

(5) Disconnect flare nut from valve to be replaced and remove valve from unit.

b. Inspect/Replace. Inspect service valves for damage and replace if suspected bad.

c. Installation.

(1) Slip valve in place and tighten flare nut.

(2) Secure with screw, lock washer, flat washer, and loop clamp.

(3) Replace dehydrator. (See para 5-31.)

(4) Leak test newly connected joints and all connections in the area.

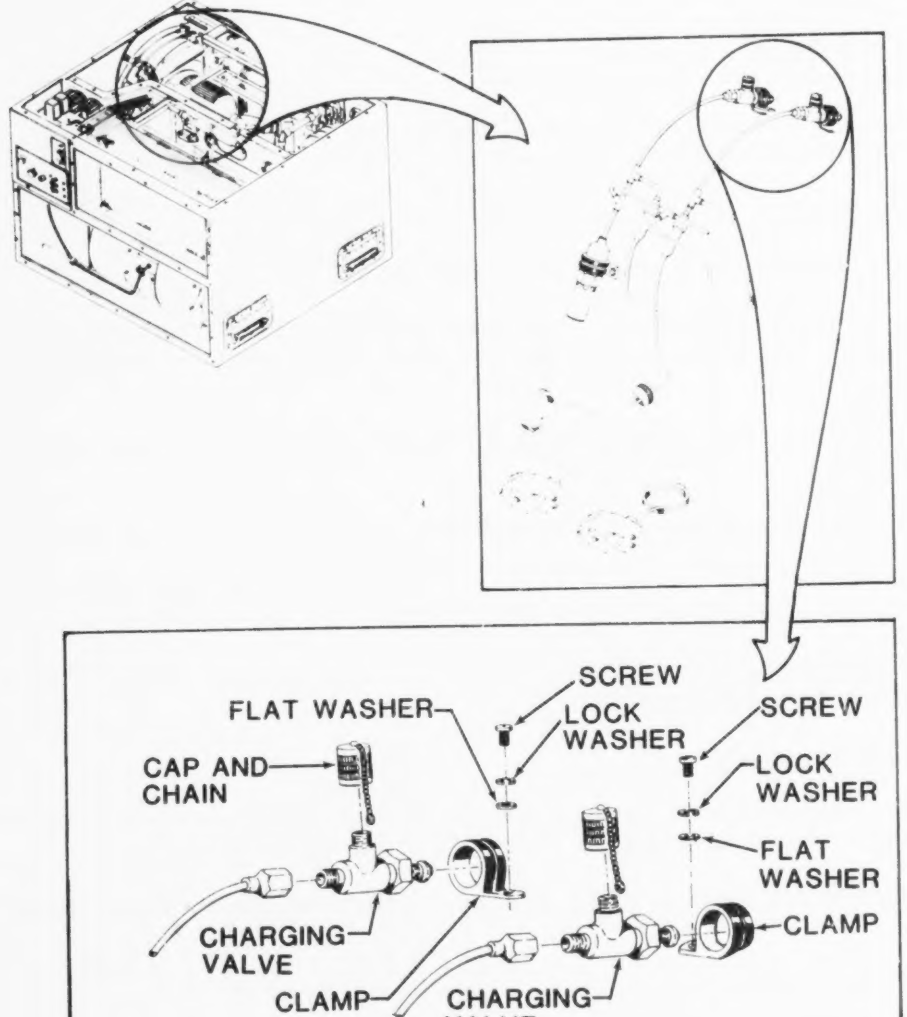
SCREW
FLAT WASHER
LOCK WASHER
SCREW
CAP AND CHAIN
LOCK WASHER
FLAT WASHER
CHARGING VALVE
CLAMP
CLAMP
CHARGING VALVE

Figure 5-16. Service (Charging) Valves

5-28. SERVICE (CHARGING) VALVES.-Continued

(5) (Models F18H-3S and F18H-1S). Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(6) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-29. PRESSURE RELIEF VALVE.

The pressure relief valve is located in the rear (compressor/condenser) compartment.

a. Removal. (See fig. 5-17.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Remove screw, lock washer, flat washer, and loop clamp.

(5) Use two wrenches, one to hold fitting and the other to remove valve. Unscrew valve and remove it from unit.

b. Inspect/Replace. Inspect pressure relief valve for damage and replace if suspected bad.

c. Installation.

(1) Use two wrenches, one to hold fitting and the other to tighten valve. Screw valve into fitting.

(2) Secure valve with a screw, lock washer, flat washer, and clamp.

(3) Replace dehydrator. (See para 5-31.)

(4) Leak test newly connected joints and all connections in the area.

(5) Install top cover(s) (para 4-11).

(6) Evacuate and charge refrigeration system in accordance with paragraphs 5-15 and 5-16.

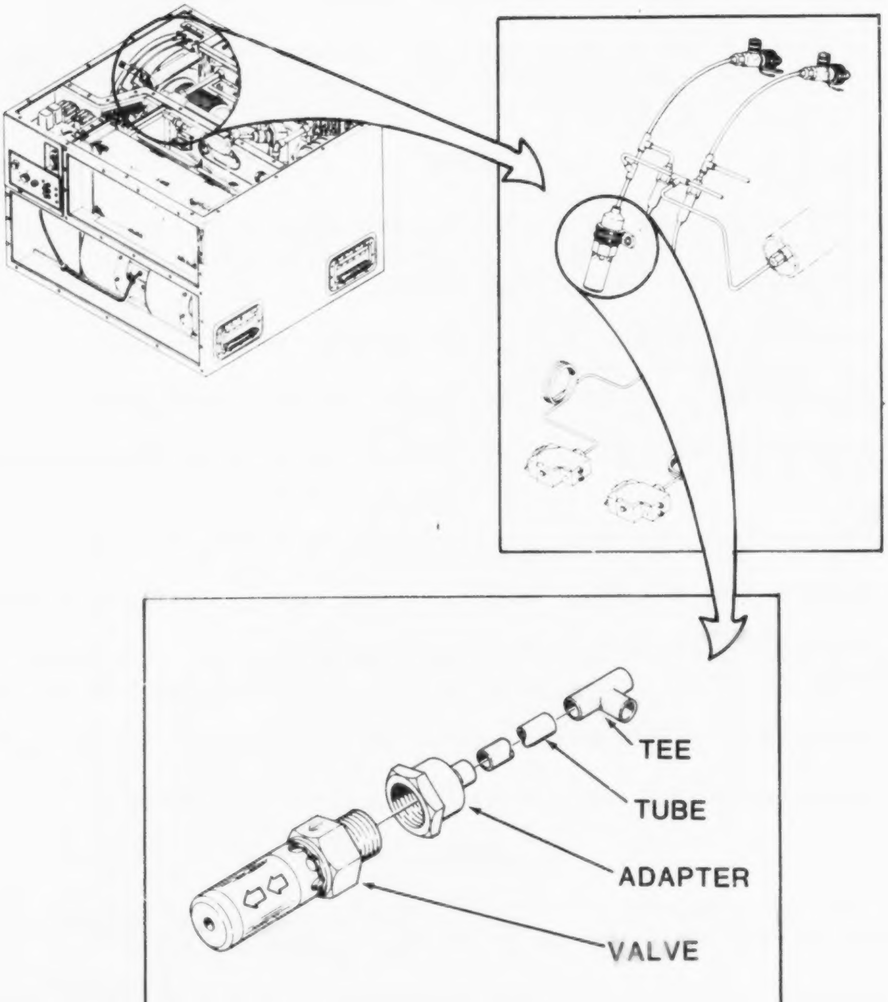
TEE
TUBE
ADAPTER
VALVE

Figure 5-17. Pressure Relief Valve

5-30. CONDENSER COIL.

The condenser coil is located across the rear of the unit. For inspection and service instructions see paragraph 4-39.

a. Removal. (See fig. 5-18.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

NOTE

The screws on the vertical frames of the condenser air inlet guard secure the condenser coil to the rear of the air conditioner housing.

(3) Remove condenser air inlet guard (para 4-12).

(4) Disconnect J11 from auxiliary power input plug.

(5) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(6) Remove four screws, two clamps, and dehydrator.

(7) Remove two screws, self locking nuts, and loop clamps.

(8) Debraze refrigeration tube connection to condenser coil and compressor to allow easy removal of coil through top of unit.

(9) Debraze top condenser coil tubing between elbow and tee.

(10) Debraze two tubes connecting coil to receiver.

NOTE

For easier removal of the condenser coil, the sight glass should be removed with the condenser coil.

(11) Remove two screws, lock washers, and sight glass mounting plate securing sight glass to housing.

(12) Remove four screws securing condenser coil to bottom of housing.

NOTE

Screws are located underneath the unit.

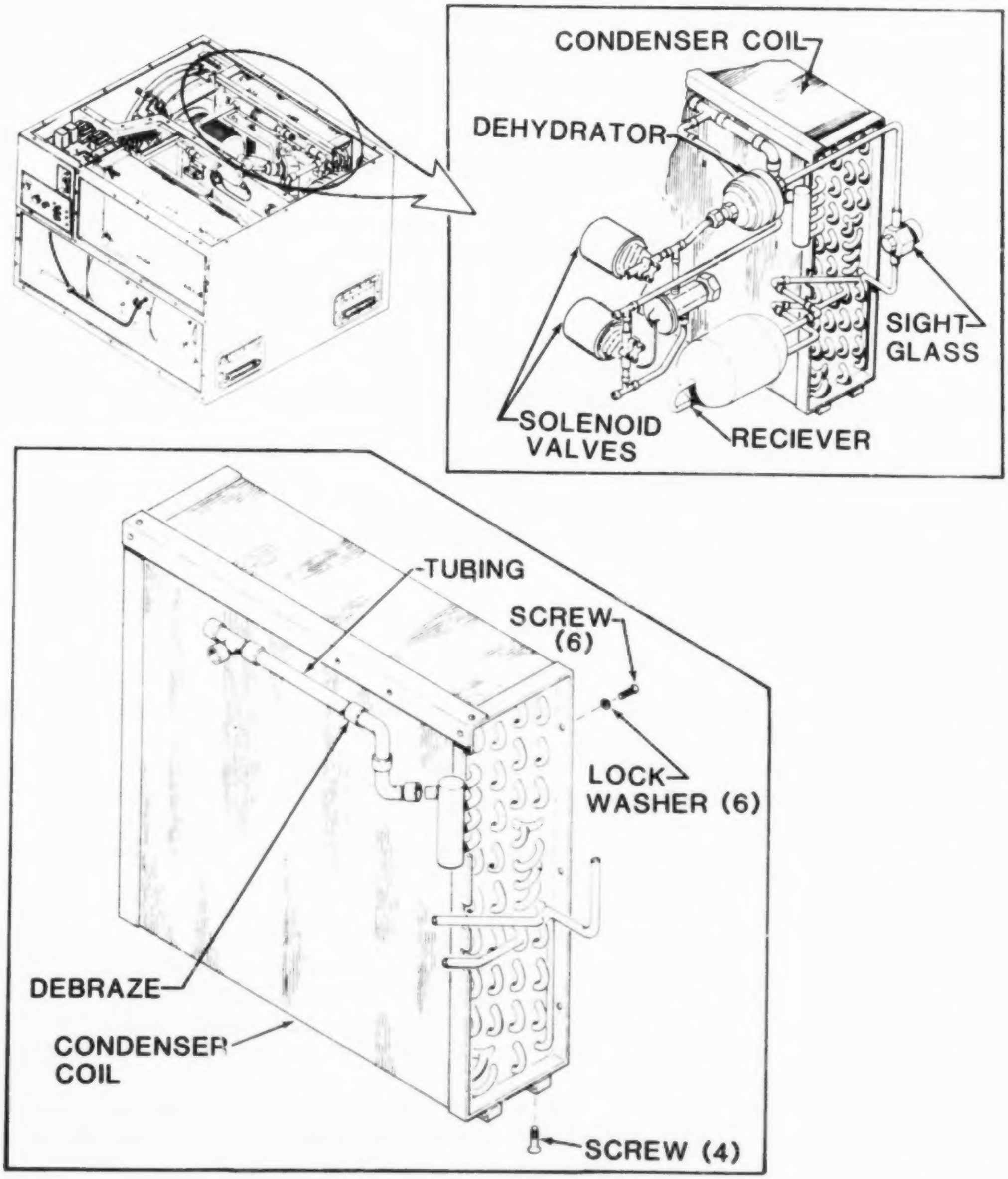
CONDENSER COIL
DEHYDRATOR
SIGHT GLASS
SOLENOID VALVES
RECIEVER
TUBING
SCREW (6)
LOCK WASHER (6)
DEBRAZE
CONDENSER COIL
SCREW (4)

Figure 5-18. Condenser Coil

5-30. CONDENSER COIL.-Continued

WARNING

When handling coil wear gloves to avoid cuts and reduce fin damage.

(13) Carefully lift condenser coil and sight glass up and out of unit.

(14) Place old coil along side of new coil so that the sight glass can be debrazed and brazed to the new coil.

b. Replace. If coil is defective replace it.

c. Installation.

(1) Braze sight glass to condenser coil tubing.

WARNING

When handling coil wear gloves to avoid cuts and reduce fin damage.

(2) Carefully place condenser coil and sight glass into housing.

(3) Secure condenser coil to bottom of housing with four screws.

(4) Secure sight glass to unit with mounting plate, screws, and lock washers.

(5) Braze refrigeration tube connections to condenser coil.

(6) Install loop clamps in place and secure with two screws and self-locking nuts.

(7) Install new dehydrator. (See para 5-31.)

(8) Connect J11 to auxiliary power input connector.

(9) Install condenser guard and secure with screws, lock washers, and snap fastener.

(10) Leak test newly connected joints and all connections in the area.

(11) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(12) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-31. DEHYDRATOR (FILTER/DRIER).

The dehydrator (filter-drier) is located in the rear (compressor/condenser) compartment. Replace the dehydrator whenever the refrigerant system is opened for any reason.

a. Removal. (See fig. 5-19.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge refrigeration system per paragraphs 5-11 and 5-12.

(4) Remove four screws and two mounting clamps.

(5) Disconnect two flare nuts and remove dehydrator from unit.

b. Inspect/Replace. Inspect dehydrator for damage and replace if damaged. Always replace dehydrator if refrigeration system is opened for any reason.

c. Installation.

CAUTION

Replacement dehydrators are packaged with sealing caps on the flare fittings to prevent moisture contamination of the desiccant filtering media. Remove these caps immediately prior to installation. Never install a dehydrator from which caps have been removed for an extended or unknown period of time.

(1) Connect flare fittings to each end of dehydrator.

(2) Install mounting clamps and secure with four screws.

(3) Leak test newly connected joints and all connections in the area.

(4) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(5) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

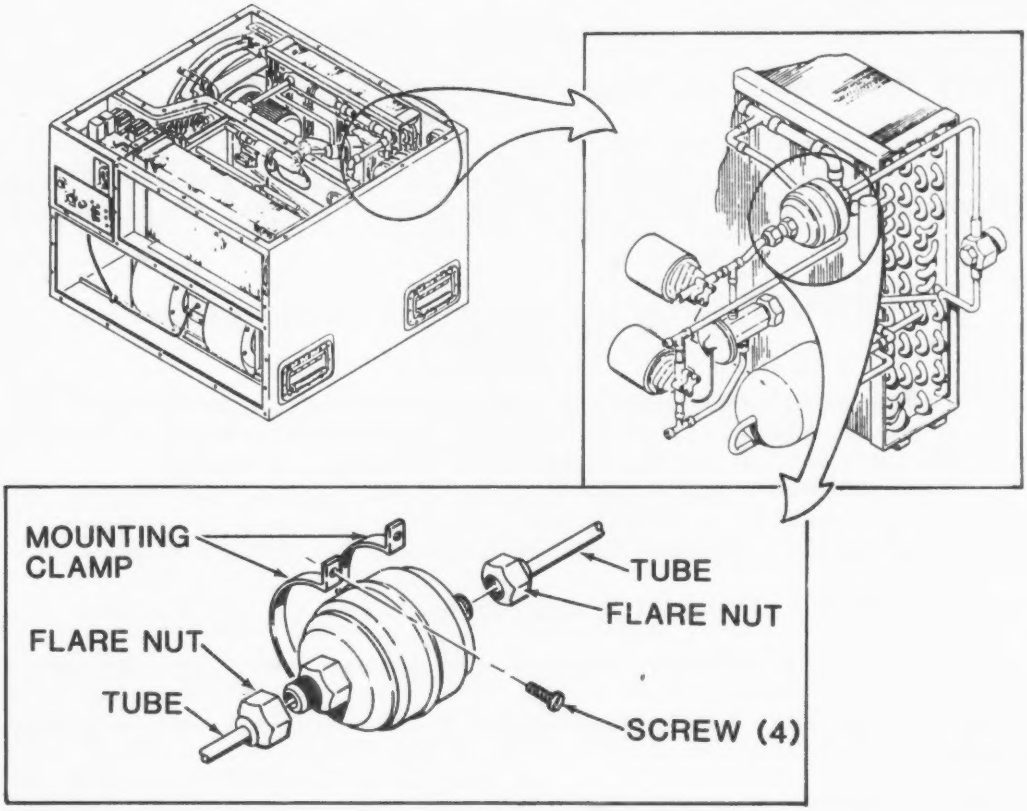
MOUNTING CLAMP
TUBE
FLARE NUT
FLARE NUT
TUBE
SCREW (4)

Figure 5-19. Dehydrator (Filter/Drier)

5-32. LIQUID INDICATOR (SIGHT GLASS).

The Liquid Indicator (sight glass) is located in the rear (compressor/condenser) compartment. It can be seen on the left rear outside face of the unit.

a. Removal. (See fig. 5-20.)

(1) Disconnect power at power source.

(2) (Models F18H-3S and F18H-1S) Remove top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Discharge and purge the refrigeration system per paragraphs 5-11 and 5-12.

(4) Disconnect J11 from auxiliary power input plug.

(5) Remove four screws, two clamps, and dehydrator.

(6) Remove two screws, lock washers, and liquid indicator mounting plate.

(7) Debraze joints and remove liquid indicator.

b. Replace. Replace liquid indicator if suspected bad.

c. Installation.

(1) Place liquid indicator in unit and align tubing ends.

(2) Protect liquid indicator from overheating during brazing operations. Direct flame away from liquid indicator body and wrap liquid indicator body with wet rags.

(3) Braze joints in accordance with paragraph 5-13.

(4) Secure liquid indicator with screws, lock washers, and mounting plate.

(5) Replace dehydrator. (See para 5-31.)

(6) Leak test all newly connected joints and all tube connections in the area.

(7) Connect P11 to J11.

(8) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

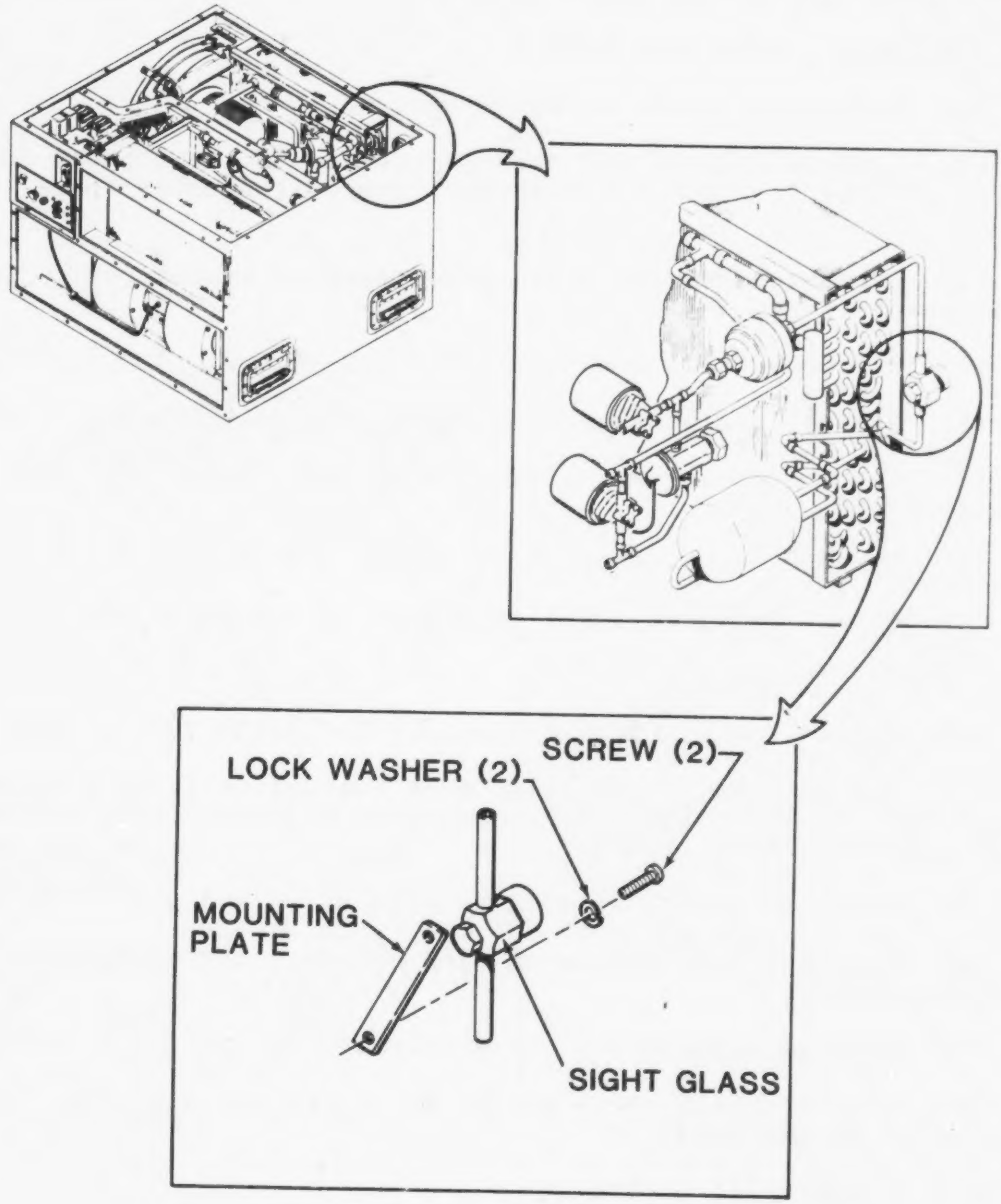
LOCK WASHER (2)
SCREW (2)
MOUNTING PLATE
SIGHT GLASS

Figure 5-20. Liquid Indicator

5-33. COMPRESSOR.

The compressor and motor assembly are hermetically sealed in a metal canister. The crankcase heater element, heater thermostat, related parts, and the electrical connector are attached to the canister externally. The compressor is located in the rear (compressor/condenser) compartment. (See fig. 5-21.)

WARNING

> Disconnect input power to the air conditioner before performing any maintenance to the electrical system. Voltages used can be lethal.

a. Inspect/Test. Electrically test heater element, heater thermostat, wiring harness, and motor as follows:

(1) Disconnect input power at its source.

(2) (Models F18H-3S and F18H-1S) Remove all three top covers (para 4-11). (Models F18H-3SA and F18H-3SB) Remove top cover (para 4-11).

(3) Disconnect wiring harness by removing P10 from J10 (located on compressor junction box).

(4) Remove compressor junction box cover.

(5) Inspect internal wiring in compressor junction box to ensure no wires are broken or grounded.

(6) Use a continuity tester or multimeter set on lowest OHMS scale to check for continuity between pins G and F in connector J10. If there is no continuity between these pins, heater or thermostatic switch is bad and should be replaced. Continue testing to isolate defective component.

(7) In the compressor junction box disconnect thermostat switch lead from crankcase heater lead. Check continuity between pin G and thermostat switch lead. If continuity is not indicated switch is defective.

(8) Check continuity at heater lead and pin F. If continuity is not indicated, heater is defective and should be replaced.

(9) Check continuity between pins D and E, if there is no continuity between these pins and the compressor has had time to cool down, the compressor motor internal overload switch (S8) is bad and compressor must be replaced.

NOTE

This illustration shows a Carrier Transicold Co. (Carlyle) compressor. Keco Industries, Inc. compressors are also available and used in some units. These compressors are interchangeable and are identical except for slight differences in appearance, method of crankcase heater attachment and suction and discharge tube connection points.

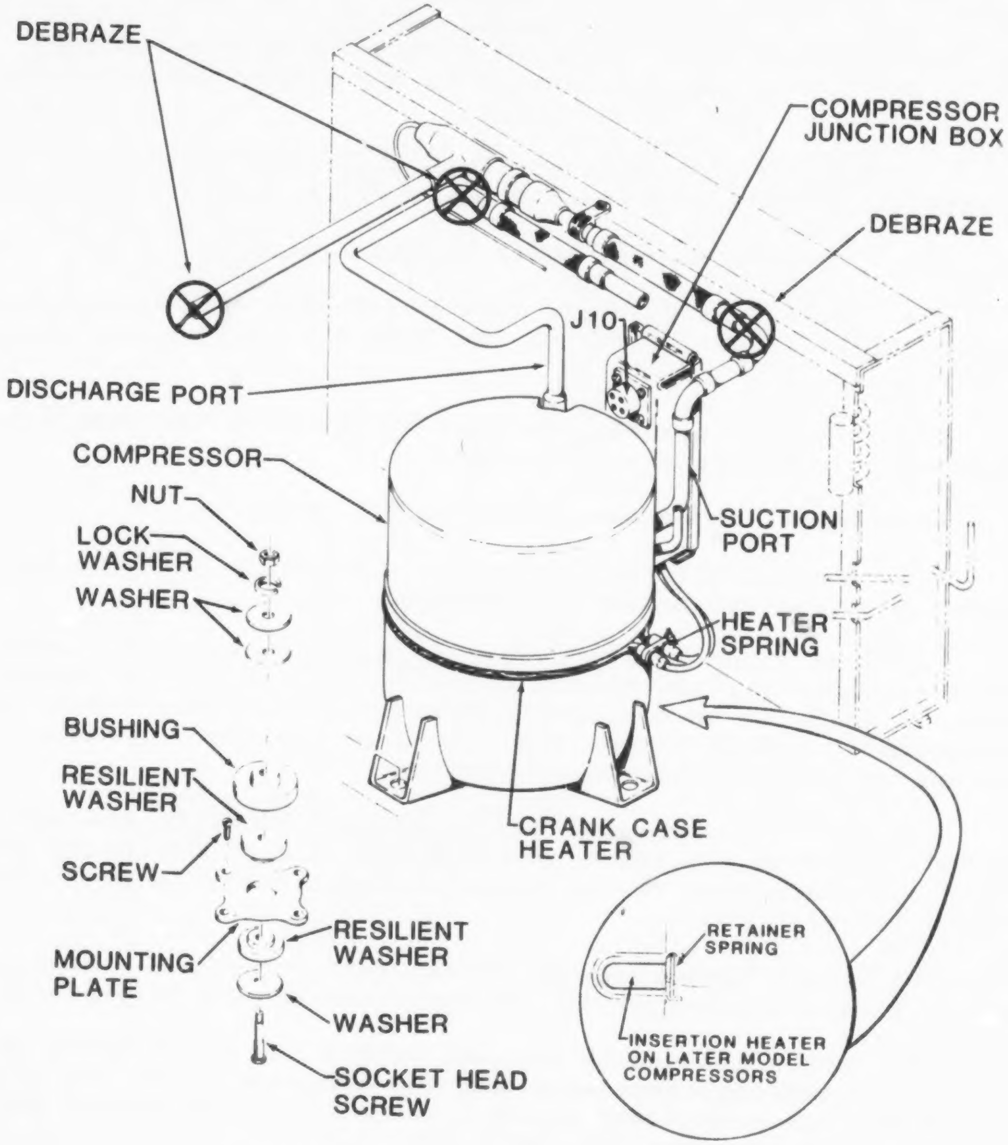
DEBRAZE
COMPRESSOR JUNCTION BOX
DEBRAZE
J10
DISCHARGE PORT
COMPRESSOR
NUT
LOCK WASHER
WASHER
SUCTION PORT
HEATER SPRING
BUSHING
RESILIENT WASHER
SCREW
CRANK CASE HEATER
RETAINER SPRING
MOUNTING PLATE
RESILIENT WASHER
WASHER
INSERTION HEATER ON LATER MODEL COMPRESSORS
SOCKET HEAD SCREW

Figure 5-21. Compressor

5-33. COMPRESSOR.-Continued

(10) Check continuity between pins A and B, B and C, and A and C. There should be continuity between each pair of pins. If there is no continuity the compressor motor is bad and compressor must be replaced.

(11) Check continuity between pins A, B, and C and the compressor body. No continuity should exist. If continuity exists the compressor is bad and must be replaced.

(12) Inspect J10 connector for loose, broken, or otherwise damaged pins or threaded connections. Replace connector if bad.

b. Repair/Replace.

(1) Heater replacement.

(a) Assuming that power has been disconnected at power source and covers have been removed during access and testing proceed as follows:

(b) Compressor must first be removed from air conditioner. See compressor removal instructions below.

(c) Remove screw(s) and terminal box cover.

(d) Identify and tag crankcase heater leads.

NOTE

Heater leads connect to J10 pin F, and the crank-case heater thermostat switch.

(e) Disconnect leads.

(f) (Carrier compressor) Remove heater spring and slide heater up over the compressor. (Keco compressor) On early models, unscrew heater clamp and slide heater up and over compressor. Later models are equipped with an insertion type heater; using a small flat tip screwdriver release retainer spring and pull heater out of cavity.

(g) On Carrier and early Keco model compressors, slide new heater over compressor and secure in place. Later model Keco compressors have insertion type heaters. Place heater in cavity and retain with spring clip.

(h) Connect heater leads. See figure 4-4 and tags.

(i) Install terminal box cover and secure with screw(s).

(j) Install compressor unit in air conditioner. (See sub para 5-33 c.)

5-33. COMPRESSOR.-Continued

(2) Heater Thermostat.

(a) Assuming that power has been disconnected at power source and covers have been removed during access and testing proceed as follows:

(b) Compressor must first be removed from air conditioner. See compressor removal instructions below.

(c) Remove screw(s) and terminal box cover. Identify and tag crankcase heater thermostat leads.

NOTE

Thermostat leads connect to J10 pin G, and the crankcase heater.

(d) Disconnect leads.

(e) Bend tabs securing thermostat switch 90° outward and remove thermostat switch.

(f) Place new thermostat switch in crankcase. Secure in place by bending retaining tabs over switch.

(g) Connect leads. See figure 4-4 and tags.

(h) Install terminal box cover and secure with screw(s).

(i) Install compressor unit in air conditioner. (See sub para 5-33 c.)

(3) Connector. (Refrigerant system discharge is not required.

(a) Assuming that power has been disconnected at power source and covers have been removed during access and testing proceed as follows:

(b) Remove retaining hardware from connector. Pull connector out of junction box to gain access to solder connections.

(c) Tag and unsolder wires.

(d) Using tags and wiring diagram figure 4-4 solder wires to new connector. Remove tags.

(e) Secure connector to compressor junction box with screws and lock washers.

(4) Compressor. (See fig. 5-21.) Two people are required for compressor removal.

(a) Assuming that power has been disconnected at power source and that covers and connector P10 have been removed during access and testing proceed as follows:

(b) Discharge and purge refrigerant system per paragraphs 5-11 and 5-12.

(c) Debraze tube connections to compressor in accordance with paragraph 5-13.

(d) Lift or tilt air conditioner to gain access to underside of housing.

(e) Remove four sets of compressor attaching hardware.

WARNING

If compressor is being removed due to burnout, use care when lifting to avoid touching compressor sludge. Acid in sludge can cause burns.

(f) Carefully lift compressor from unit.

(g) Check compressor, using the following procedure, to see if a motor burnout is indicated.

- After removal of a bad compressor from refrigeration system, remove all external tubing and tip compressor toward discharge port to drain a small quantity of oil into a clear glass container.
- If oil is clean and clear, and does not have a burnt acid smell, the compressor did not fail because of motor burnout. If a burnout is not indicated proceed to c (Installation).
- If oil is black, contains sludge, and has a burnt acid odor, the compressor failed because of motor burnout.

5-33. COMPRESSOR.-Continued

CAUTION

When a hermetic motor burns out, the stator winding decomposes forming carbon, water and acid which contaminates refrigerant systems. These contaminates must be thoroughly removed from the system to prevent repeated motor failures. Motor burnout may also cause damage to the air conditioner electrical system. The following clean up procedures must be followed in any case of compressor motor burnout.

(h) Perform removal procedure (step (4), preceding page).

(i) Remove the dehydrator (para 5-30). Do not replace with a new dehydrator at this time.

(j) Flush the refrigerant system with refrigerant solvent R-114 dichlorotetrafluroethane (National Stock Number 6830-00-782-6512). Flushing should be done under a pressure of 8 to 12 psig (.56 to .84 kg/cm^2), using a pump of approximately 1/3 horsepower. The R-114 may be recirculated if run through a 10 micron filter. Procedures for flushing the system are as follows:

- Refer to figure 5-22 and connect the discharge line of the pump to the tubing at point 1. Connect the recovery line to the tubing at point 2. Leave the suction line service valve (point 3) closed. Cap the tubing at points 4 and 5.
- Start the pump and flush the line for approximately 10 minutes then turn the pump off.
- Remove the recovery line from point 2 and cap the tubing at point 2.
- Connect the recovery line to the valve at point 3 and open the suction line service valve.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Disconnect the bypass solenoid valve plug P8 from receptacle J8.
- Energize the bypass solenoid valve by applying 24 volts dc across pins A and B of plug P8.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.

FIND NO	PART NO.	QTY	NOMENCLATURE
1	13211E3793	1	COMPRESSOR
2	13216E6167-1	1	HOSE ASSY, METAL
3A	13221E9358	1	COIL, CONDENSER WITH ANGLE
3B	FIND NO. 3A	1	SUB COOLER
4	13216E6163-2	1	RECEIVER, LIQUID REFRIGERANT
5	13216E6155	1	INDICATOR, SIGHT, LIQUID
6	13214E3557	1	DEHYDRATOR, DESICCANT, REFRIGERANT
7	13216E6172-1	1	SOLENOID VALVE, WITH LEADS
8	13216E6160-2	1	VALVE, EXPANSION (PRIMARY)
9	13216E6161	1	RESTRICTOR, FLUID FLOW
10	13216E6119	1	COIL, EVAPORATOR WITH ANGLE
11	13216E6166	2	BULB WELL
12	13216E6167-2	1	HOSE ASSY, METAL
13	13216E6168	2	VALVE, SERVICE
14	13211E9369	1	VALVE, PRESSURE RELIEF
15	13216E6128	1	CYLINDER ASSY, ACTUATING, LINEAR
16	13216E6215-3	1	SWITCH, PRESSURE (HIGH)
17	13216E6174-2	1	VALVE, EXPANSION (QUENCH)
18	13216E6172-2	1	SOLENOID VALVE, WITH LEADS
19	13216E6171	2	REGULATOR, FLUID PRESSURE
20	13216E6215-1	1	SWITCH, PRESSURE (LOW)

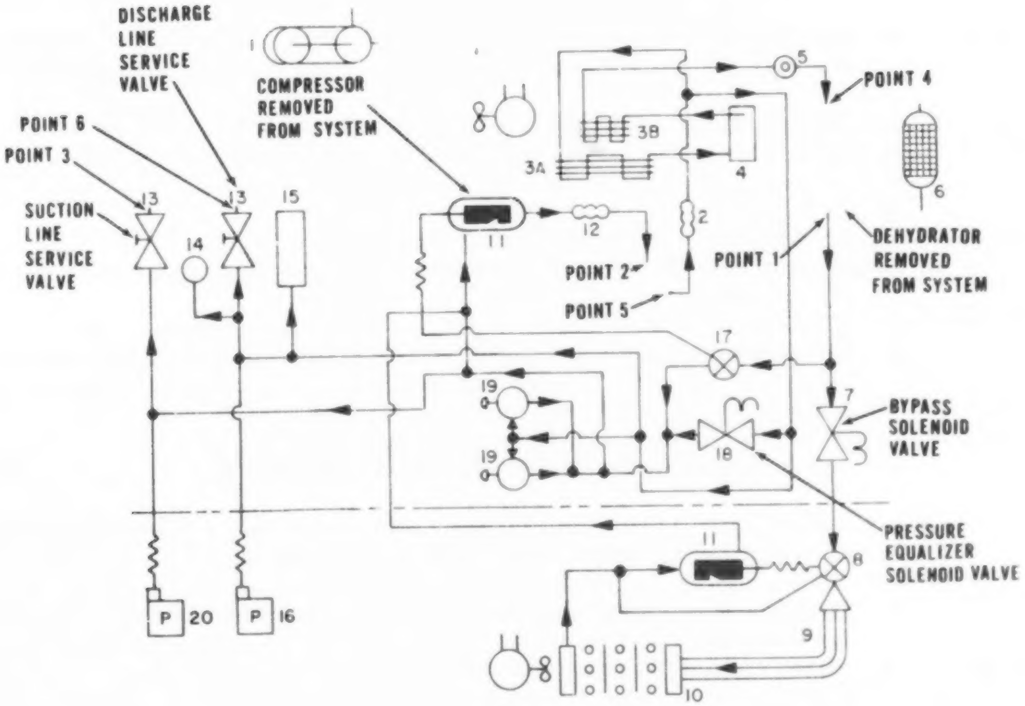
DISCHARGE LINE SERVICE VALVE
COMPRESSOR REMOVED FROM SYSTEM
POINT 6
POINT 3
SUCTION LINE SERVICE VALVE
POINT 4
DEHYDRATOR REMOVED FROM SYSTEM
POINT 1
POINT 2
POINT 5
BYPASS SOLENOID VALVE
PRESSURE EQUALIZER SOLENOID VALVE
1
2
3A
3B
4
5
6
7
8
9
10
11
11
12
13
13
14
15
17
18
19
19
P 20
P 16

Figure 5-22. Refrigerant Flow System with Dehydrator and Compressor Removed

5-33. COMPRESSOR.-Continued

- Switch the pump lines so that the discharge line is connected to the valve at point 3 and the recovery line is connected to the tubing at point 1.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Close the suction line service valve and move the discharge line from the valve at point 3 to the tubing at point 2.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- De-energize the bypass solenoid valve by disconnecting the dc voltage source from pins A and B of plug P8.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Uncap the tubing at points 4 and 5.
- Disconnect the pump discharge line from the tubing at point 2 and connect it to the tubing at point 5.
- Disconnect the recovery line from the tubing at point 1 and connect it to the tubing at point 4.
- Cap the tubing at points 1 and 2.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Move the pump discharge line from the tubing at point 5 to the valve at point 6. Cap the tubing at point 5.
- Open the discharge line service valve.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Switch the pump lines so that the discharge line is connected to the tubing at point 4 and the recovery line is connected to the valve at point 6.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.

5-33. COMPRESSOR.-Continued

- Remove the cap from the tubing at point 2. Disconnect the pump discharge line from the tubing at point 4 and connect it to the tubing at point 2. Cap the tubing at point 4.
- Disconnect the pressure equalizer solenoid valve plug P9 from receptacle J9.
- Energize the pressure equalizer solenoid valve by applying 24 volts dc across pins A and B of plug P9.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- Remove the cap from the tubing at point 5.
- Remove the pump discharge line from the tubing at point 2 and connect it the tubing at point 5.
- Remove the recovery line from the valve at point 6 and connect it to the tubing at point 2. Close the valve at point 6.
- Start the pump and flush the line for approximately 10 minutes, then turn the pump off.
- De-energize the pressure equalizer solenoid valve by removing the voltage source from pins A and B of plug P9.
- Disconnect the discharge and recovery lines from the tubing and remove all caps from the tubing.

(k) Refer to figure 5-22 and purge the system with nitrogen at approximately 30 psig (2.11 kg/cm^2) as follows:

- Make sure caps are off the tubing at all points and that the suction and discharge line service valves are open.
- Connect the nitrogen line to the tubing at point 1 and release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Energize the bypass solenoid valve by applying 24 volts dc across pins A and B of plug P8.

5-33. COMPRESSOR.-Continued

- Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Remove the nitrogen line from the tubing at point 1 and connect it to the tubing at point 2. Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- De-energize the bypass solenoid valve and release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Energize the pressure equalizer solenoid valve by applying 24 volts dc across pins A and B of plug P9.
- Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Remove the nitrogen line from the tubing at point 2 and connect it to the tubing at point 5. Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- De-energize the pressure equalizer solenoid valve and release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Remove the nitrogen line from the tubing at point 5 and connect it to the tubing at point 4. Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Remove the nitrogen line from the tubing at point 4 and connect it to the valve at point 6. Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.

5-33. COMPRESSOR.-Continued

- Remove the nitrogen line from the valve at point 6 and connect it to the valve at point 3. Release nitrogen into the system for approximately 5 minutes or until moisture ceases to be discharged from the system.
- Remove the nitrogen line from the valve at point 3.
- Close the suction line and discharge line service valves.
- Cap all open tubing until installation of new components.
- Replace dehydrator (para 5-30).
- Reconnect plugs P8 and P9 to receptacles J8 and J9 respectively.

c. Installation. (See fig. 5-21.)

CAUTION

The compressor is supplied with a complete charge of oil. Take care that oil is not lost when handling and installing compressor.

NOTE

Prior to installing compressor, inspect resilient mounts and mounting hardware for deterioration. Replace if necessary.

NOTE

If any refrigeration piping was disconnected with the compressor removal, transfer the piping to the replacement compressor before installing it in the air conditioner.

(1) Place compressor on resilient washers and bushings while aligning with mounting holes.

(2) Tip unit up slightly and install four resilient washers, flat washers, and sockethead screws from bottom.

(3) Install washers, lock washers, and nuts and tighten securely.

5-33. COMPRESSOR.-Continued

(4) Braze tube connections in accordance with paragraph 5-13.

(5) Replace dehydrator. (Not necessary if replaced after refrigerant system cleaning and purging.)

(6) Connect P10 connector.

(7) Leak test newly connected joints and all connections in the area.

(8) (Models F18H-3S and F18H-1S) Install top rear cover (para 4-11). (Models F18H-3SA and F18H-3SB) Install top cover (para 4-11).

(9) Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16.

5-34. TUBING AND FITTINGS.

The refrigeration system contains a number of pieces of copper tubing in a variety of material grades, sizes, lengths, and shapes, and a number of elbows, tees and adapters in several sizes. Observe the following when replacing any piece of tubing or fitting in the system:

WARNING

Be sure the refrigeration system is fully discharged and purged, and that dry nitrogen is flowing through the system at a rate of 1-2 cfm (0.028 - 0.057 m^3/minute) before brazing or debrazing. Death or injury could occur from exposure to refrigerant gases under pressure.

Test/Replace.

a. Replace tubing and fittings only with equal material, grade, size, length, and shape as the item removed.

b. Leak test the entire refrigeration system in accordance with paragraph 5-14 after any replacement action that required brazing.

c. Replace the dehydrator and leak test the dehydrator flare fittings as the final step in any maintenance action that required the refrigeration pressure system to be opened.

d. Evacuate and charge the refrigeration system in accordance with paragraphs 5-15 and 5-16 after all other maintenance actions are completed.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

	Section/Paragraph
Repair Parts Special Tools, TMDE, and Support Equipment	I
General	6-1
Authorized General Support Maintenance Actions	II
General	6-2
Housing	6-3

Section I REPAIR PARTS SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

6-1. GENERAL.

Repair parts are listed and illustrated in TM 5-4120-384-24P. No special tools are required for general support maintenance of the air conditioner. Test, maintenance, and diagnostic equipment (TMDE), and support equipment, include standard electrical test equipment, and standard pressure and vacuum gages, vacuum pumps, and servicing manifolds found in any general support maintenance refrigeration shop.

Section II AUTHORIZED GENERAL SUPPORT MAINTENANCE ACTIONS

6-2. GENERAL.

The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair of replacement of insulation or lifting fittings on the housing, and replacement of the cabinet base. However, general support maintenance may be called upon, at times, to perform any or all of the MAC items listed for organizational and direct support maintenance for rehabilitation or overhaul of an air conditioner.

6-3. HOUSING.

See paragraph 4-40 for inspection and service of the housing.

a. Repair.

(1) Repairs are limited to rework of broken or cracked welds, straightening of bent or dented sheet metal and replacement of handles, gaskets, insulation, and rivnuts and some small sheet metal parts by drilling out rivets and installation of replacement parts.

(2) Disassemble unit as necessary and make repair as indicated.

(3) Gasket and insulation replacement.

(a) Use only gaskets, insulation, or name plates identified in TM 5-4120-384-24P.

NOTE

An initial supply of adhesive is supplied as Item 2, Section II, Expendable Supplies and Materials List. (See Appendix E.)

(b) Remove as much old gasket or insulation material as possible by pulling or scraping it away from the metal surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use a well-ventilated area, wear gloves, and keep away from sparks or flame.

(c) Soften and remove old adhesive and gasket residue, using acetone or methyl-ethyl (MEK) and a stiff brush.

(d) Coat the mating surfaces of the metal and gasket with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to fingers.

(e) Starting with an end, carefully attach the gasket to the metal. Press into firm contact all over.

(f) Minor dents and bent edges can be straightened using common sheet metal repair procedures.

6-3. HOUSING.-Continued

(g) Should touch up or refinishing be necessary, see TM 43-0139.

b. Replacement.

(1) Housing replacement requires total unit disassembly. Normally if the unit is damaged to this extent it should be replaced.

(2) If housing replacement is attempted see individual installation instructions of components for reinstallation of items removed.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, and technical manuals referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms	DA 2028
Hand Receipt	DA 2062
Equipment Inspection and Maintenance Worksheet	DA 2404
Quality Deficiency Report	SF 368

A-3. TECHNICAL MANUALS.

Painting Instructions for Field Use	TM 43-0139
Hand Receipt Manual	TM 5-4120-384-14HR
Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List	TM 5-4120-384-24P
Procedures for Destruction of Equipment to Prevent Enemy Use	TM 750-244-3

A-3. TECHNICAL MANUALS.-Continued

• Administrative Storage of Equipment	TM 740-90-1
• Radio Interference Suppression	TM 11-483
• Leak Detector, Refrigerant Gas	TM 9-4940-435-14

A-4. SPECIFICATIONS.

• Dry Cleaning Solvent	Fed. Spec. P-D-680

A-5. MISCELLANEOUS PUBLICATIONS.

• Hand Portable Fire Extinguishers Approved for Army Users	TB 5-4200-200-10
• Fuels, Lubricants, Oil, and Waxes	C91001L
• Army Regulations Handbook	AR 310-2
• The Army Maintenance Management System (TAMMS)	DA Pamphlet 738-750
• Electric Motor and Generator Repair	FM 20-31

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I INTRODUCTION

B-1. GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance catagories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance catagories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

B-2. MAINTENANCE FUNCTIONS.-Continued

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services, including fault location/trouble-shooting, removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/actions) prescribed to restore an item to a completely serviceable/ operational condition as prescribed by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc) considered in classifying Army equipments/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00."

b. Column 2, Component/Assembly Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see paragraph B-2.)

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows.

C...................Operator or Crew
O...................Organizational Maintenance
F...................Direct Support Maintenance
H...................General Support Maintenance
D...................Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains a note number which shall correspond to the notes contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Reference Code. The code scheme recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II

MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
01	HOUSING COVERS, PANELS, GRILLES, SCREENS AND INFORMATION PLATES								
	Covers	Inspect	0.1						
		Service		0.5					Note 1
		Repair			2.0				
		Replace			1.0				
	Panels	Inspect	0.1						
		Service		0.5					Note 1
		Repair			2.0				
		Replace			1.0				
	Screens and Guards	Inspect	0.1						
		Service	0.2						Note 2
		Replace			0.5				
	Louvers	Inspect	0.1						
		Adjust	0.1						
		Service		0.1					
		Replace			1.0				
	Information Plates	Inspect	0.1						
		Service	0.1						
		Replace			0.5				
02	AIR CIRCULATING AND CONDENSATE DRAIN SYSTEM								
	Air Filter	Inspect	0.2						
		Service		1.0					
		Replace		0.5					

MAINTENANCE ALLOCATION CHART-Continued

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
	Mist Eliminator	Inspect		0.5					
		Service		1.0					
		Replace		0.5					
	Condenser Air Discharge Louver and Linkage	Inspect		0.5					
		Service		1.0					
		Adjust		1.0					
		Replace		2.0					
	Fresh Air Damper and Actuator	Inspect		0.5					
		Service		0.5					
		Adjust	0.1	0.5					
		Replace		2.0					
	Condensate Traps and Drain Tubes	Inspect	0.1	0.5					
		Service		0.5					
		Replace		1.0					
03	ELECTRICAL								
	Control Module	Inspect	0.1						Note 3
		Adjust	0.1						
		Repair		2.0					Note 4
		Replace		0.5					
	Temperature Control (Thermostat)	Inspect		0.1					
		Adjust	0.1						
		Test		1.0					
		Replace		1.0					
	MODE SELECTOR Switch	Inspect		0.1					
		Adjust	0.1						
		Test		0.5					
		Replace		1.0					
	COMPR (compressor) CIRCUIT BKR (breaker)	Inspect		0.1					
		Test		0.5					
		Replace		1.0					

MAINTENANCE ALLOCATION CHART-Continued

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
	Control Module Wiring Harness	Inspect		0.5					
		Test		1.0					
		Repair		1.0					
		Replace		2.0					
	Junction Box	Inspect		1.0					Note 4
		Repair		2.0					
		Replace		2.0					
	Junction Box Wiring Harness	Inspect		0.5					
		Test		1.0					
		Repair		1.0					
		Replace		12.0					
	Relays	Inspect		0.2					
		Test		1.0					
		Replace		1.5					
	Control Circuit Breaker	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Unit Wiring Harness	Inspect		1.0					
		Test		2.0					
		Repair		1.0					
		Replace		4.0					
	Capacitor C1,C2	Inspect		0.1					
		Test		0.2					
		Replace		0.5					
	Rectifier	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Transformer	Inspect		0.1					
		Test		0.5					
		Replace		1.0					
	Capacitors C2,C3,C4,C5 (F18H-1S)	Inspect		0.1					
		Test		0.5					
		Replace		1.0					

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MAINTENANCE ALLOCATION CHART-Continued

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
04	EVAPORATOR FAN MOTOR AND HEATER								
	Fan and Housing	Inspect		0.5					
		Service		1.0					
		Replace		2.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
	Heater Thermostat	Inspect		0.1					
		Test		1.0					
		Replace		0.5					
	Heater Elements	Inspect		0.1					
		Test		0.5					
		Replace		2.0					
05	CONDENSER FAN, AND MOTOR								
	Fan and Housing	Inspect		0.5					
		Service		0.5					
		Replace		1.0					
	Motor	Inspect		0.5					
		Test		0.5					
		Repair			2.0				Note 5
		Replace		3.0					
06	REFRIGERATION SYSTEM								
	Evaporator Coil	Inspect		0.5					
		Service		1.0					
		Replace			8.0				

MAINTENANCE ALLOCATION CHART-Continued

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
	Expansion Valves	Replace			8.0				
	Solenoid Valves	Test		0.5					
		Repair		1.0					Note 6
		Replace			8.0				
	Pressure Regulator	Replace			8.0				
	Actuating Cylinder	Inspect			0.1				
		Adjust			1.0				
		Replace			8.0				
	Pressure Switches	Inspect			0.1				
		Test			0.5				
		Replace			8.0				
	Service Valves	Inspect			0.5				
		Replace			8.0				
	Pressure Relief Valve	Inspect			0.5				
		Replace			8.0				
	Condenser Coil	Inspect		0.5					
		Service		1.0					
		Replace			8.0				
	Dehydrator	Inspect			0.1				
		Replace			8.0				
	Liquid Indicator	Inspect	0.5						
		Replace			8.0				
	Compressor	Test			0.5				
		Repair			1.0				Note 7
		Replace			12.0				

MAINTENANCE ALLOCATION CHART-Continued

(1) Group No.	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category					(5) Tools & Equip.	(6) Remarks
			C	O	F	H	D		
	Tubing and Fittings	Test Replace			0.5 8.0				
07	HOUSING								
	Housing	Inspect Service Repair Replace		0.5 0.5		 1.0 24.0			
08	ACCESSORY/LOOSE ITEMS								
	Connectors	Inspect Replace		0.5 2.0					
	Installation Hardware	Inspect Replace		0.5 1.0					

Section III TOOL AND TEST EQUIPMENT REQUIREMENTS

MAINTENANCE ALLOCATION CHART

(1) Tool/Test Equipment Ref Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
		NOTE No special tools and test equipment required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II:		
1	O-F-H	Tool kit, service, refrigeration Unit (SC 5180-90-CL-N18)	5180-00-597-1474	
2	F-H	Pump, Vacuum	4310-00-289-5967	
3	O-F-H	Soldering Gun Kit	3439-00-930-1638	
4	O-F-H	Brush, Bristle	7520-00-223-8000	
5	O-F-H	Brush, Wire	7920-00-282-9246	
6	O-F-H	Bucket	7240-00-137-1609	
7	O-F-H	Heat Gun	4940-01-042-4855	
8	O-F-H	Multimeter	6625-00-553-0142	
9	O-F-H	Pliers, Long Round Nose	5120-00-268-3579	
10	O-F-H	Rubber Gloves	8415-00-266-8677	
11	O-F-H	Safety Goggles	4240-00-052-3776	
12	O-F-H	Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293	
13	O-F-H	Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014	

Section IV REMARKS

MAINTENANCE ALLOCATION CHART

Reference Code	Remarks
Note 1	Replace gasket insulation and information plates.
Note 2	Straighten bent blades.
Note 3	External components only (knobs and switches).
Note 4	Replace components.
Note 5	Replace bearings, thermal overloads or connector.
Note 6	Replace solenoid valve coil only.
Note 7	Replace external components only.
	Other than those items listed above there are no supplemental instructions or explanatory remarks required for the maintenance functions listed in Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I INTRODUCTION

C-1. SCOPE.

This appendix lists components of end item and basic issue items for the Air Conditioner to help you inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items Lists are divided into the following sections.

a. Section II, Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are minimum essential items required to place the Air Conditioner in operation, to operate it and to perform emergency repairs. Although shipped separately packed, BII must be with the Air Conditioner during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII based on Table(s) of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE) authorization of the end item.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listings:

a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. Indicates the National stock number assigned to the item which will be used for requisitioning.

c. Column (3) - Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) - Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II COMPONENTS OF END ITEM

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) QTY RQR
4-36		Connector, Receptacle Electrical (97403) 13216E6177		EA	1
4-36		Connector, Plug Electrical (97403) 13216E6209-1		EA	1
4-36		Connector, Plug Electrical (96906) MS3106R18-11S		EA	1
4-37		Screw, Cap, Hex Head (96906) MS90726-64		EA	4
4-37		Washer (97403) 13216E6138-2		EA	4
4-37		Mount Resilient (97403) 13216E6137		EA	8
4-37		Spacer (97403) 13216E6152		EA	4
4-37		Tube Elastomeric (97403) 13216E6153		EA	4

Section III BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	Usable On Code	(4) U/M	(5) QTY RQR
		Department of the Army Technical Manual; Operator's, Organizational, Direct Support, and General Support Maintenance Manual TM5-4120-384-14		EA	1
		Department of the Army Technical Manual; Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List TM5-4120-384-24P		EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of the air conditioner.

D-2. GENERAL.

This list identifies items that do not have to accompany the air conditioner and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING.

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identified as follows: (Not applicable.)

Section II ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM and Part Number	Usable On Code	(3) U/M	(4) Qty RQR
7520-00-559-9618	Cotton Duck Case		EA	1
7510-00-889-3494	Log Book Binder		EA	1

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I INTRODUCTION

E-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the Air Conditioner. These items are authorized to you by CTA 50-970, Expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. EXPLANATION OF COLUMNS.

a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use coater air filter, Item 1, Appendix E").

b. Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column 3, National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e. g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	4130-00-860-0042	Coater, Air Filter, 1 pint container	ea
2	F	3040-00-664-0439	Adhesive, General Purpose, 1 pint container	ea
3	O	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81348)	gl
4	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb (Refrigerant-22) BB-F-1421, type 22 (81348)	cy
5	F	6830-00-782-6512	Dichlorotetrafluroethane Technical: w/cylinder 50 lb (Refrigerant-114) BB-F-1421, Type 114 (81348)	cy
6	O	3439-01-045-7940	Flux, Solder, Liquid, Rosin Base MIL-F-14256	qt
7	O		Solder, Lead-Tin, QQ-S-571 Type SN60WRP2	
8	F	6830-00-292-0732	Nitrogen	cy
9	F		Brazing alloy, silver QQ-B-564, grade O, I, or II	oz
10	F		Brazing alloy, silver QQ-B-564, grade III	oz
11	F	3439-00-640-3713	Flux, brazing O-F-499, type B	oz
12	F	5350-00-192-5047	Abrasive cloth	pg
13	F	7920-00-205-1711	Rags	pg
14	O		Silicon Spray, P/N AS193, (61014)	oz

GLOSSARY

Section I ABBREVIATIONS

AAL	Additional Authorized List
AWG	American Wire Gauge
BII	Basic Issue Items
BKR	Breaker
BTU	British Thermal Unit
C	Centigrade
CBR	Chemical-Biological-Radiological
cfm	Cubic Feet per Minute
cm	Centimeter
cm^2	Square Centimeter
COEIL	Components of End Item List
COMPR	Compressor
CTA	Common Table of Allowances
EIR	Equipment Improvements Recommendations
F	Fahrenheit
fig	Figure
FSCM	Federal Supply Code for Manufacturer
HR	Hour
JTA	Joint Table of Allowances
kg	Kilogram
LB	Pounds
LPCO	Low Pressure Cutout Switch
m^3	Cubic Meter
MAC	Maintenance Allocation Chart
MEK	Methyl-Ethyl Ketone
MTOE	Modified Table of Organization and Equipment
NPT	National Taper Pipe (Thread)
NSN	National Stock Number
para	Paragraph
PMCS	Preventive Maintenance Checks and Services
psig	Pounds per Square Inch Gauge
RPSTL	Repair Parts and Special Tools List
TAMMS	The Army Maintenance Management System
TB	Terminal Board
TDA	Table of Distribution and Allowances
TMDE	Test Measurement and Diagnostic Equipment
TOE	Tables of Organization and Equipment
U/M	Unit of Measure
VDC	Volts Direct Current

Section II DEFINITION OF UNUSUAL TERMS

NONE

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25C Operator, Organizational, Direct & General Support Maintenance Requirements for Air Conditioners 18,000 BTU, Compact.

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THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER: TM 5-4120-384-14

PUBLICATION DATE: 27 May 85

PUBLICATION TITLE: AIR CONDITIONER 18,000 BTU/HR

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please Correct one or the Other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got What I ordered, so the NSN is Wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER: JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe
JOHN DOE

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
miles	kilometers	1.609
square inches	square centimeters	6.451
square feet	square meters	.093
square yards	square meters	.836
square miles	square kilometers	2.590
acres	square hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29,573
pints	liters	.473
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound-feet	newton-meters	1.356
pound-inches	newton-meters	.11296

To change	*To*	*Multiply by*
ounce-inches	newton-meters	.007062
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
square centimeters	square inches	.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	.386
square hectometers	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
liters	gallons	.264
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 057556-000